VOLUME 30 NUMBER 3 MARCH, 1947

AMERICAN JOURNAL OF OPHTHALMOLOGY

THIRD SERIES FOUNDED BY EDWARD JACKSON

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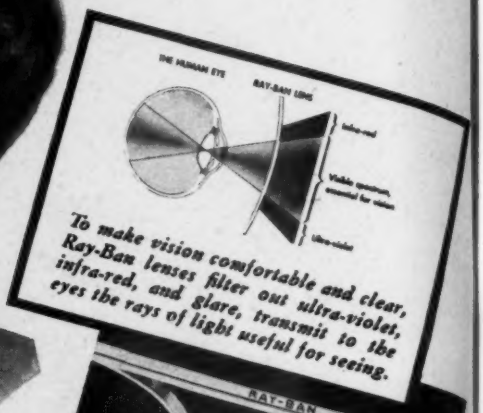
Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars. Published monthly by the Ophthalmic Publishing Company. Subscription and Advertising Office: 837 Carew Tower, Cincinnati, Ohio. Entered as second class matter at the post office at Menasha, Wisconsin.



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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 30 MARCH, 1947 NUMBER 3

THE INFLUENCE OF HYPERSENSITIVITY ON ENDOGENOUS UVEAL DISEASE*

THE JACKSON MEMORIAL LECTURE

ALAN C. WOODS, M.D.
Baltimore, Maryland

It is my privilege tonight to deliver the Jackson Memorial Lecture. I am deeply appreciative of the high honor. I knew Dr. Jackson only as one of the great stalwarts of ophthalmology. He was one of the leaders of his day. To my mind he achieved his high position through the happy combination of many sterling qualities: a searching and analytical mind, a tireless and meticulous attention to detail—but details were never allowed to obscure his prime objective—a rugged honesty, and above all a kindly love for his fellow man. Although it was never my good fortune to serve under him, or be trained directly by him, no man who received his training in the period I did could help but be influenced for the better by Dr. Jackson's example and teachings. I freely acknowledge the debt.

The subject I have chosen for this lecture may at first glance appear somewhat foreign to the subjects in which Dr. Jackson was preëminently interested. Yet I excuse myself this seeming digression by recollecting a remark that Dr. Jackson once made to me. It was some years ago at a medical convention in Texas, when I had delivered a lengthy and probably quite dull lecture on the relation of immunity in syphilis to syphilitic disease of the eye. After a perfunctory discussion had come to a close and the business had moved on to the next paper, Dr. Jackson sought me out and went out of his way to thank me for the paper. When I told him I was afraid it was a little foreign to the general interest of the audience, he told me frankly that he was well-aware of this, but he believed it was a healthy step to present such subjects to ophthalmologists, and that he, for one, trusted I would continue to do so. I have never forgotten his kindliness or the sincerity of his advice. So with this pleasant memory, I have less temerity than I would otherwise have in discussing the subject of this paper—"The Influence of Hypersensitivity on Endogenous Uveal Disease."

Primarily there is an enormous confusion in the terminology of the hypersensitive reaction. This applies especially to the word "allergy." As used originally by von Pirquet it was defined as an altered reaction capacity of the organism. Its meaning was gradually extended by von Pirquet to include the general bodily changes that occur with advancing years—even those which might favor the development of malignant tumors. Although in the minds of most medical men the term

* Delivered on October 16, 1946, at the convention of the American Academy of Ophthalmology and Otolaryngology. From the Wilmer Ophthalmological Institute of the Johns Hopkins Hospital and University.

allergy is synonymous with acquired hypersensitiveness, it is used with a wide variety of meanings. Some authors limit its application to certain specific types of hypersensitivity; others use it to include all types of hypersensitiveness to foreign antigens, both bacterial or nonbacterial; and still others include in its meaning all forms of altered reaction capacity, including immunity. Rich has frankly stated that "the term 'allergy' has become so debauched by indiscriminate usage that it would be fortunate indeed if it could be dropped completely from the vocabulary of science."

This confusion of terminology is reflected in ophthalmic literature to such an extent that the terms hypersensitivity and allergy are used almost as scrap baskets or coveralls, being invoked to explain a variety of mysterious and often totally unrelated conditions for which there is no obvious explanation. Thus, we reach the final absurdity where we find a uveitis of unknown etiology attributed to an assumed allergy to an undiscovered virus! Scylla piled upon Charybdis!

Yet despite this indiscriminate and unjustified use of specific terms, and the definite gaps which exist in our knowledge, there is nevertheless a great fund of information on the hypersensitivity reaction and a generally accepted terminology. This knowledge and the terminology have recently been set forth in an orderly manner by Rich,[1] and since I know of no clearer exposition for our purposes here, we may follow his presentation.

The types of hypersensitivity

Two definite forms of hypersensitivity are recognized—the anaphylactic state and the hypersensitivity of infection. While there are many superficial resemblances between these two types, there are, nevertheless, differences so fundamental that they can be clearly differentiated.

I. Anaphylaxis

A. The anaphylactic state is a form of hypersensitivity which results when foreign protein enters the tissues. When this hypersensitivity is once established, if small amounts of the same foreign protein are brought into contact with the sensitized tissues, either by intracutaneous injection or a patch test, a localized urticarial weal develops. If the antigen enters the circulation in sufficient quantities, various anaphylactic manifestations occur which include urticaria, "serum sickness," complete collapse, and even death. These symptoms come on promptly after the second exposure to the foreign protein and are caused by a spasmodic contraction of the involuntary smooth muscle and an increase in capillary permeability.

In addition to the local and general reactions, a focal reaction can occur in the anaphylactic type of hypersensitivity. Thus, if the initial or sensitizing injection of the foreign protein is given directly in the eye or in the cornea, and the second "intoxicating" injection is given intravenously, a sudden sharp inflammatory reaction may take place in the injected eye. This is a form of the "ophthalmic reaction" produced by protein antigens. It is manifestly due to a local increased reaction capacity of the eye, although it is not fully established to what degree this is due to a local vascular reaction dependent on the increased capillarity induced by the primary injection.

The anaphylactic type of hypersensitivity is probably produced exclusively by proteins. When it is apparently dependent on such nonprotein substances as inorganic chemicals, drugs, carbohydrates, and the like, the probable mechanism is a combination of the foreign, nonprotein material with the native protein of the body to form a new protein compound

which is foreign to the host. The anaphylactic manifestations result from an antigen-antibody reaction affecting primarily the fixed cells of the involuntary smooth muscle, the endothelium of the capillaries, and collagen fibers. While the anaphylactic reaction is characterized by edema, increased capillary permeability, congestion, hemorrhage, and spasm of the smooth muscle, it does not produce *per se* necrosis or death of the fixed cells. The anaphylactic type of hypersensitivity can be passively transferred, and is usually accompanied by the presence of specific percipitins in the body fluids.

B. The Arthus phenomenon is essentially an exaggerated local type of anaphylactic reaction. If foreign proteins, including the soluble portions of bacterial proteins, are introduced repeatedly and in small amounts into the tissues at intervals of several days instead of only once, an anaphylactic state will be produced. After sensitivity appears, the injections of the protein at first call forth the usual urticarial weal which vanishes in a few hours. But as these injections are continued, at last the introduction of a small amount of the foreign protein will produce an enduring local reaction characterized by hemorrhage, necrosis, and finally sloughing of the skin at the site of the reaction. In the case of bacterial protein, the Arthus type of hypersensitivity can be induced only by the injection of the soluble portions of the bacterial proteins, and when thus established, the phenomenon is elicited by the injection of the soluble bacterial proteins. While the Arthus phenomenon superficially resembles the reaction of the bacterial type of hypersensitivity, in that it may produce local necrosis, the fundamental mechanism is quite different. The local necrosis and death of the fixed cells in the Arthus phenomenon is not caused by a direct action on the extravascular tissue cells but is due to an interference of their blood supply by thrombosis and rupture of the nutrient vessels.

C. The "pollen" type of hypersensitivity, which is produced not only by pollens but also by other protein agents, is quite similar to the usual anaphylactic type. It differs from it chiefly in its tendency especially to involve certain tissues, the bronchioles, nasal, and conjunctival mucous membranes, and in the fact that, although the antibody is demonstrated in the serum by passive transfer, its specific precipitins are ordinarily not demonstrable in the serum. In other respects—the immediate reaction, urticaria, erythema, smooth muscle spasms, and so forth—it is indistinguishable from the anaphylactic reaction. Since the differences are not fundamental, it may be regarded as a form of anaphylactic hypersensitivity.

II. The hypersensitivity of infection—bacterial hypersensitivity—the tuberculin type of hypersensitivity

These terms are all synonomous and are used to describe a type of hypersensitivity quite different from the anaphylactic type in its various characteristics. This type of hypersensitivity can be readily induced by parenteral contact of the tissues with the living or dead bacteria, fungi, or filterable viruses, but not by any soluble antigens so far extracted from microörganisms. However, once it is established by contact with the bacterial bodies, reactions may be elicited by injection of the soluble bacterial proteins. The bacterial type of hypersensitivity is not characterized by the appearance of precipitins in the blood serum, and it cannot be passively transferred. The reactions elicited in the hypersensitive patient or experimental animal are: (a) a local, and (b) if the specific antigen is introduced in sufficient quantity, a systemic and (c) a focal reaction.

A. The local reaction. When the bacteria causing this hypersensitive state, or their soluble products, are introduced in the hypersentitive tissues, there is no immediate reaction, but a delayed reaction which comes on after some hours and reaches its maximum in 24 to 48 hours. The local reaction is characterized by erythema and edema, and in its extreme form by local tissue necrosis and sloughing. The cells of the body with the bacterial type of reaction are damaged by the contact of the antigen with the cell body, both in vitro and in vivo, and if the antigen-antibody reaction is sufficiently intense, the cells may be actually killed.

B. The systemic reaction. If the antigen is introduced in sufficient quantity, there may occur a severe systemic reaction, but unlike the anaphylactic reaction, this reaction is delayed and comes on gradually after some hours. In its mild form the systemic reaction is characterized by malaise, joint pains, fever, and so forth. In its severe form, death may ensue. The mechanism of this delayed reaction is not understood. It is variously believed that the antigen-antibody reaction may produce a toxin which damages the cells or that the cells undergo some bodily alteration which makes them capable of exerting an enzymlike activity on the antigen with the liberation of an irritant substance.

C. The focal reaction. In addition to the local and systemic reactions, a "focal" reaction may be induced if sufficient quantities of antigen are introduced. This focal reaction consists in the lighting up of any remote focus of infection caused by the specific infecting agent. Again it is a delayed reaction, coming on only after some hours.

The bacterial type of hypersensitivity differs from the anaphylactic type, therefore, in the fact that it can be produced only by introduction of the whole bacteria, and not by soluble protein; therefore, it usually follows infection and vaccination with the bacterial body. The reaction to later introduction of the antigen is delayed and is accompanied by local inflammation, and often necrosis. There may occur also systemic and focal reactions. The site of the reaction is not limited to the involuntary, smooth-muscle capillary endothelium and collagen fibers, but is a widespread reaction in the sensitized cells of the body, and is associated with no demonstrable excess of free antibody in the circulation. The antigen-antibody reaction acts directly on the cells, causes cellular damage, and may cause death of the cells.

While anaphylactic and bacterial hypersensitivity are fundamentally different and in the main tend to be mutually exclusive, they can, nevertheless, occur together in the same individual or animal. Thus after bacterial infection, the infected body may develop not only the usual bacterial type of hypersensitivity from the protein of the bacterial body, but may also develop the anaphylactic type of sensitivity to the soluble products of the bacteria. For example, in pneumococcal infections the bacterial type of hypersensitivity to the pneumococcal protein may develop and also an anaphylactic type of hypersensitivity to the specific polysaccharide of the pneumococcus. Likewise in tuberculosis, while the injection of tuberculin or tuberculo-protein will not induce the tuberculin type of hypersensitivity, under certain conditions an anaphylatic type of sensitivity to tuberculin may develop.

III. Immunity

There remains one last term to define—"Immunity." In general, immunity may be defined as an increased resistance to infection. This increased resistance may be either native to the organism or acquired by infection or inoculation. There are two main, recognized phases to the phenome-

non of immunity. The first is a humoral factor, due to the antibodies circulating in the blood stream and tissue fluids, which tend to fix, immobilize, and opsonize the bacteria, and in some infections may provoke extracellular destruction. The second is a cellular phase, centered chiefly in the mononuclear and phagocytic cells, which engulf the opsonized bacteria and either inhibit their proliferation or destroy them. In most infections, the important role of antibodies and phagocytes is readily demonstrable. In tuberculosis, the role of the circulating antibody is not as well-established as in various other infections, although it probably plays an important part.

The essential basic manifestations of acquired resistance are inhibition of the spread of bacteria and the suppression of their proliferation. In acute infections, this is accompanied by an actual destruction of the bacteria. In tuberculosis, however, while many bacilli are destroyed by the forces of acquired resistance, bacteriostasis with fixation and immobilization of the bacteria is prominent. Thus the bacilli may long remain viable, ready to proliferate and spread when the forces of resistance which hold them in check diminish and wane.

There has been much confusion on the relationship of allergy and immunity. For example, in tuberculosis, and indeed in many other infections, for years it was generally accepted that allergy (that is, a hypersensitive state) was responsible for the immunity (that is, acquired resistance)—that the hypersensitive reaction inhibited the spread of the invading specific bacteria and suppressed their proliferation. This idea was challenged by Rich and his co-workers in 1929.[2] In a long series of experiments by these and other investigators, it was clearly demonstrated that acquired resistance is in no way dependent on hypersensitivity. There is no actual correlation between the two. Hypersensitive inflammation itself is incapable of preventing the spread of invading bacteria in the absence of acquired resistance. Effective acquired resistance can be established in the complete absence of any hypersensitive reaction.

Allergy (acquired hypersensitivity) and immunity (acquired resistance) should, therefore, be regarded as distinct phenomena. It should, however, be born in mind that as a result of infection or exposure to specific bacteria, both allergy and immunity tend to develop in the infected body. For example, both in clinical and experimental tuberculosis, the infected body usually develops a well-marked hypersensitivity to tuberculoprotein, while at the same time it shows a marked resistance to reinfection. This same holds true in other infections. The two phenomena, hypersensitivity and resistance, are, however, independent one of the other.

So much then for a brief summary of the clinical characteristics and fundamental differences of the two recognized types of hypersensitivity, a definition of acquired resistance or immunity, a word as to its mechanism, and its independence of any hypersensitive reaction. The main question before us is in what way the different types of hypersensitivity, both of which may follow infection, may influence endogenous uveal disease, how such influences may be suspected and detected, and how they may direct our therapeutic attack on the ocular disease.

Types of endogenous uveitis

Endogenous uveitis may conveniently be divided into three different groups: (1) sympathetic ophthalmia and the so-called endophthalmitis phacoanaphylactica; (2) the various metastatic purulent infections of the eye which arise from direct infection by blood-born bacteria;

(3) the usual nonpurulent uveitis, iritis, or choroiditis, which so often is recurrent, and comprises the greater percentage of all uveal disease.

While there is considerable evidence that a hypersensitive reaction is of paramount importance in both sympathetic ophthalmia and endophthalmitis phacoanaphylactica, the hypersensitivity in these diseases is dependent on the organ-specific proteins of the eye itself. This is a separate problem which has been amply discussed elsewhere, and is not germane to the present subject. Likewise, the various forms of metastatic ophthalmia, endophthalmitis, choroiditis spetica, and panophthalmitis, which result from the direct infection of the eye by bacteria carried by the blood stream, do not concern us in this discussion. In such direct infection with the usual pathogenic organisms, the process either becomes localized and walled-off with varying amounts of damage to the eye, or the infection spreads through the eye with the picture of a purulent ophthalmia. We are here concerned with the acute, the recurrent, and the chronic uveitis which constitute the usual clinical picture.

The older writers divided disease of the anterior uvea into "serous" and "plastic" iritis. To my mind, a much better terminology is "nongranulomatous" and "granulomatous," for these terms give an indication of the underlying pathologic process. In some instances it may be difficult or even impossible to make this differentiation, but as a rule the clinical pictures, as well as the underlying pathology of these two forms of inflammation, are quite different. The salient characteristics of these forms of uveitis are as follows.

Nongranulomatous uveitis. In the anterior uvea the onset is usually acute, rather than isidious, and ciliary congestion is marked with pronounced photophobia and lacrimation. The inflammatory reaction in the iris is usually slight and is limited to loss of luster, blurring of the iris pattern, and dilatation of the capillaries. There are no nodules and but little tendency to the formation of posterior synechia unless there are repeated recurrences. The aqueous ray is usually intense due to the outpouring of serum, and there may even be a heavy gelatinous or fibrinous exudate in the anterior chamber. The deposits on the posterior surface of the cornea are small and pin-point and are composed chiefly of lymphocytes. Heavy, greasy exudates do not occur, and there is little or no tendency to capsular clouding of the lens. Koeppe nodules are never observed. The course of a nongranulomatous iritis is usually short, and the eyes usually recover with amazingly few residuæ. Only after repeated attacks is organic damage done to the eye.

A nongranulomatous inflammation in the posterior uvea is not so typical, and the diagnosis may be difficult or impossible. The general characteristics of a nongranulomatous choroiditis are slight clouding in the vitreous, fine muscae, wide-spread and intense subretinal edema, blurring of the neuroretinal outlines, obscuration of the physiologic cup, overfilling of the retinal-venous bed, and the absence of manifest or well-defined choroidal exudates. There is little tendency to actual tissue destruction and secondary gliosis.

Granulomatous uveitis. In the anterior uvea, the onset of the granulomatous iritis is usually insidious. The cellular reaction in the tissues is greater than the vascular reaction, and the ciliary congestion is not usually severe. Organic changes take place in the iris, with thickening of the stroma from cellular infiltration, with blurring of the iris pattern, and with loss of the normal luster. Well-defined nodules or tubercles on the surface of the iris, or diffuse localized thickenings suggesting nodules

deep in the iris stroma, are sometimes present. There is a marked tendency to the formation of posterior synechiae, with greasy exudates on the anterior capsule of the lens and capsular clouding. The keratitic precipitates are of the so-called "mutton fat" variety, and histologically consist chiefly of epithelioid cells. Koeppe nodules, or accumulations of epithelioid cells at the pupillary border of the iris, are not uncommon. The aqueous ray may be intense. More often, however, it is rather mild.

In the posterior uvea, the granulomatous type of inflammation is usually marked by heavy veils and exudates in the vitreous. Manifest visible exudates in the choroid are the rule and they quickly involve the overlying retina. The subretinal edema may be diffuse, but it is usually localized and limited to the portion of the fundus adjacent to the exudates. The exudates are at first ill-defined. In some cases they spread and tend to involve the entire fundus with necrosis and destruction of the choroid and retina with later secondary gliosis. In other instances, they become quickly circumscribed and limited. In either case, the essential underlying pathologic process is tissue destruction with secondary overgrowth of glial tissue. When the process is localized, as in the well-known "circumscribed plastic choroiditis," recurrences are common, and usually take place contiguous or at the site of the earlier lesion.

In the main, nongranulomatous and granulomatous uveitis tend to be mutually exclusive, the clinical picture usually following one or the other pattern. A few cases are encountered in which differentiation is difficult, characteristics of both types appear present in the same eye—acute inflammation followed by granulomatous changes. In these cases one has the impression that both processes are present together.

Etiology of nongranulomatous and granulomatous uveitis

There is a definite conflict of opinion on the etiology of endogenous uveitis. This is not remarkable since there are no fluids readily available for culture or animal inoculation, and no tissue for biopsy. The etiologic diagnosis is made on clinical observation, correlation of the clinical picture with the accumulated histologic material from similar eyes, and the general study of the patient. As a result, the literature reflects the individual clinical acumen and the knowledge of clinical-histologic correlation of the various reporters and their resources for medical study of the patient. While most authors agree that the various forms of uveal inflammation are infective in nature, they admit the clinical picture is quite different from the purulent reactions usually induced by bacterial metastasis. It is assumed that in some unknown way, either by passage through the body or by the local environment in the eye, the usual action of the infecting bacteria has become modified and an atypical picture results.

A great number of ophthalmologists believe that remote foci of infection are the most important cause of uveal disease, the disease in the eye resulting either from direct bacterial metastasis, or from toxins liberated from the focus of infection. While syphilis, tuberculosis, and other systemic diseases are recognized as causes of endogeneous uveitis, they are considered less important. Another group of ophthalmologists places chief emphasis on tuberculosis and the other so-called infectious granulomas as etiologic factors. Still others express a middle-of-the-road opinion. There is little differentiation in the literature between the etiology of nongranulomatous and granulomatous uveitis. In fact, these terms are not in common usage. In general, however, the type of uveitis described here as nongranuloma-

tous is usually believed to be infective in nature, caused in one way or another, by the usual common pathogenic bacteria. The causes usually recognized for granulomatous disease are syphilis, tuberculosis, brucellosis, sarcoid, lymphogranuloma venereum, and certain fungus infections. It is quite probable that other etiologic agents, viruses and unrecognized bacterial infections, may produce a similar pathologic picture—for in an appreciable percentage of granulomatous uveitis, the most thorough medical survey reveals no recognizable cause.

In recent years, it has become fashionable to speak continually of allergy as influencing and actually causing endogenous uveitis, although rarely, if ever, does there appear to be any clear concept of the type of hypersensitive reaction involved, or the mechanism thereof. However, in many cases there appears to be a close correlation between the anaphylactic state, the hypersensitivity of bacterial infection, and the various manifestations of uveitis. It is not my intention to repeat here any of the statistical or experimental studies already published on the etiology of uveitis. Rather I would present to you my overall impression on the influence of the different types of hypersensitivity on endogenous uveitis, the methods used for the detection of the hypersensitive state, and what therapeutic measures may be used to combat it.

Nongranulomatous uveitis

The clearest-cut examples of nongranulomatous uveitis are the recurrent iris inflammations found in association with rheumatoid arthritis and old gonococcal infections. A similar acute iritis is sometimes found following acute systemic infections and is occasionally found in association with remote foci of infection, no other obvious cause being apparent. The ocular picture in these conditions follows the same general pattern of nongranulomatous iritis already described. The course is sometimes so stormy that an inexperienced ophthalmologist might almost despair of saving the eye, but the disease finally subsides in a relatively short time with practically no organic damage to the eye. This type of iritis is remarkably resistant to ordinary forms of treatment. Certainly in my experience neither the sulfa drugs nor penicillin appear to influence the course of the disease, although some form of heat therapy, either nonspecific protein-therapy induced hyperpyrexia or prolonged local diathermy, appears of value.

Is this type of iritis due to the actual presence of living bacteria in the tissues of the eye? My contention is that in the recurrent nongranulomatous iritis associated with rheumatoid arthritis, old gonococcal infection, and sometimes with focal infection, there is no evidence whatsoever of living bacteria in the eyes. All the evidence, both clinical and experimental, is against such a supposition and points strongly to a hypersensitive reaction being the basic cause.

Influence of hypersensitivity in nongranulomatous uveitis

Acute iritis. Various authors (Kolmer,[3] Berens, Rothbard, Angevine, and others[4]) have commented on the routinely negative blood cultures obtained in patients with acute iritis. It is true, however, that these cultures have been made after the outbreak of the iritis, and it is still conceivable that cultures immediately prior to the onset of the iritis might have been positive. However, such specimens of the aqueous as have been examined are sterile on culture and bacteriologic examination. In my experience, not only have the blood and aqueous cultures been sterile, but animal inoculations of the aqueous, either intraperitoneal in guinea pigs or in the

anterior chamber of a rabbit's eye, have all been negative.

Experimental investigations also argue against the actual presence of living bacteria in the eye and are in favor of a hypersensitive reaction being responsible for nongranulomatous iritis. Inoculation of the eye, either by direct injection in the aqueous or by intracarotid injection, of various strains of streptococci, pneumococci, and such organisms almost invariably results in a purulent ophthalmia which may progress up to destruction of the eye, according to the virulence of the invading organism. However, if the animals are sensitized to streptococci by repeated intracutaneous injections of living organisms, or by an infected agar implant, and the organisms are later brought into contact with the eye, a nonpurulent inflammatory reaction is produced. This was first described by Derick and Swift in 1929[5] as "the ophthalmic reaction." These authors produced the ocular inflammation in sensitized animals by corneal scarification and instillation of the organisms in the conjunctival sac. This procedure has been amplified and modified by others. It has been clearly shown that a nonpurulent iritis may be produced in animals by various forms of systemic or local sensitization and by intoxication by intravenous injection of the antigen. Specific attention has been called to the fact that the iritis so produced corresponds clinically to that observed in humans. The picture is ciliary congestion, dilatation of the iridic vessels, contraction of the pupil, and even small exudates in the anterior chamber. The course is short and acute. The inflammatory process lasts several days only and then subsides without organic residua. Histologic examination of such eyes shows cellular infiltration of the iris, chiefly by lymphocytes and plasma cells (Brown[6]). If foreign proteins, such as heterologous serums, are used as antigens, the ocular reaction is prompt. If bacterial antigens are used, the ocular reaction is usually delayed.

The most frequent positive findings in patients with nongranulomatous iritis are evidences of rheumatoid arthritis, an old gonococcal infection with a positive gonococcus complement-fixation reaction, a small active focus of infection, or a history of a recent acute infection of some type. Syphilis, tuberculosis, or other infectious granulomas are conspicuously absent. Positive reactions for bacterial hypersensitivity are the rule in these patients. The usual diagnostic procedures to detect such bacterial hypersensitivity are the intracutaneous injections of a 1:100 dilution of killed 24- to 48-hour cultures of various common organisms—alpha streptococci, beta streptococci, nonhemolytic streptococci, H. influenza, gonococci and finally a 1:100 dilution of mixed streptococci. The tests are read at the end of 15 minutes for an immediate anaphylactic type reaction to the soluble bacterial products. They are read again at 48 hours for the delayed tuberculinlike reactions to the protein of the bacterial body. The delayed tuberculinlike reaction is almost constantly present, although frequently, especially in the case with an acute fibrinous or gelatinous exudate in the anterior chamber, an immediate reaction to the soluble bacterial products is also present.

A word of caution must be given concerning the interpretation of the cutaneous reactions to bacterial antigens. The bacteria concerned are all common organisms to which the average individual has been constantly exposed for years, and reactivity to the intracutaneous inoculation of these organisms may occur in normal individuals, and may be especially marked after any acute infection. Before any diagnostic significance is attached to positive reactions, it should be estab-

lished: (1) that no other obvious cause can be found to which the uveitis is attributed; (2) that the patient shows an especial and unexplained hypersensitivity to specific organisms and not to all the bacteria tested; and (3) that the specific reactions shown are greater than are found in normal control individuals. With these reservations, in my experience, positive cutaneous reactions to such bacterial antigens are of diagnostic significance in nongranulomatous uveitis.

If the clinical nongranulomatous iritis under discussion is due to bacterial hypersensitivity, immediately it may be asked: What is the mechanism whereby the hypersensitive state is produced in the eyes and how does intoxication occur?

One can only surmise the mechanism through experimental analogy. Primarily, since the reaction is usually limited to the eye and only rarely accompanied by an urticaria or any pronounced general symptoms, one must assume an increased reaction capacity of the uveal tract. It has been clearly shown that such a local, increased-reaction capacity can be evoked experimentally by direct inoculation of the eye with the antigen. Therefore, to explain the clinical picture, it may be assumed that at some time the sensitizing bacteria have directly reached the eye. This may occur during the course of any transient acute bacteremia, which is certainly not uncommon, arising either from an acute general infection, from a remote infected focus, or by absorption from an infected, or even a normal, mucous membrane or cutaneous surface. The infecting dose of organism must be so small or of such low-grade virulence that the invading organisms are readily killed off by the bactericidal action of the ocular fluids, otherwise a purulent ophthalmia would result. If there is a repetition of such a bacteremia or later absorption of the soluble products of the bacterial body, such antigens, when they reach the eye, encounter sensitized tissue and produce a hypersensitive reaction. This is the mechanism in the experimental animal, and from what is known of the frequency of transient bacteremias and infected mucous-membrane and cutaneous surfaces in man, it is a plausible explanation for the clinical phenomenon.

Occasionally the intoxicating bacterial protein may reach the eye from the exogenous source in such concentration that it may evoke symptoms in an eye not especially hypersensitive but only participating in the general tissue hypersensitivity. This is the case in the experimental ophthalmic reaction when the eyes are sensitized as part of the general tissue reaction, and intoxication is produced by local trauma of the eye and contact with the specific antigen. An analogous picture may occasionally occur clinically. Such a clinical phenomenon appeared to be the case in a physician whose eye was accidentally exogenously infected with streptococci. Two days later, he developed an acute nongranulomatous iritis. He was found to have a high degree of hypersensitivity to the specific invading streptococcus, and no other cause for the iritis could be found.

Is the hypersensitivity responsible for such a nongranulomatous iritis of the immediate anaphylactic type or of the delayed tuberculin type? In humans there is obviously no way of determining the time relation of the antigen entering the eye to the beginning of symptoms. In experimental animals, the evidence indicates the reaction is usually of the tuberculin type if bacterial antigens are employed. Thus Derick and Swift clearly showed that the ocular and general sensitivity produced by streptococcus antigens was of the delayed type, and the ophthalmic reaction came on 48 hours after the corneal scarification. Brown reported that

in his sensitized animals the first signs of iritis produced by intravenous injection of bacterial antigens were observed only after five hours. In MacLean's experiments, where the iritis was produced by intravenous intoxication, the reaction came on from 24 to 48 hours after the last intravenous injection. However, if foreign serums are used as the sensitizing antigens, the anaphylactic type of hypersensitivity results. This was first demonstrated by Kümmel in 1910,[7] who found iridocyclitis with exudation in the anterior chamber six hours after intravenous injection of the foreign serum in animals previously sensitized by intraocular injection. However, this iritis was so marked at the end of six hours that it is obvious the first symptoms must have occurred much earlier. Such immediate reactions when foreign serums were used have been found by various other investigators (Wessely,[8] Krusius[9]).

An anaphylactic type reaction in the eye was also shown by an experiment I did in 1916.[10] In this experiment, the eyes of dogs sensitized by systemic injection of horse serum were later perfused with defibrinated blood. When horse serum was added to the perfusion fluid, there was an immediate contraction of the pupil, together with conjunctival and pericorneal congestion and the occurrence of petechial hemorrhages throughout the fundus. This appeared to be an example of spasmodic contraction of sensitized smooth muscle and of increased capillary permeability produced in eyes with the anaphylactic type of hypersensitivity on contact with the specific antigen.

It is apparent, therefore, that in experimental animals either the delayed bacterial type or the immediate anaphylactic type of hypersensitivity may be produced in the eye according to the type of sensitizing antigen employed. When patients are tested with bacterial antigens, the delayed reaction is usually found, although frequently, especially in patients with acute exudation in the anterior chamber, there may also be an immediate reaction to the soluble bacterial products. It is a plausible hypothesis that such hypersensitivity to the soluble bacterial products may be responsible for the acute edematous reaction. It has already been noted that the initial attacks of nongranulomatous iritis rarely produce much appreciable damage to the eye, but after repeated attacks, damage and tissue destruction often occur. These later organic changes are probably the result of repeated minor insults caused by an antigen-antibody reaction on fixed cells with the bacterial type of hypersensitivity. However, it is an interesting speculation that in patients who also show an associated anaphylactic type of hypersensitivity the final damage done by repeated attacks may in part be a true Arthus phenomenon in the eye; that is, tissue destruction and secondary connective-tissue changes due to interference with the blood supply by thrombosis or rupture of the nutrient vessels.

This concept of nongranulomatous uveitis as a bacterial-hypersensitivity phenomenon obviously suggests desensitization as a therapeutic procedure. Such desensitization should be as specific as possible. In the case of streptococci, there are now some 40 odd antigenically different strains known. The specific strains responsible for the hypersensitive state should be determined, if possible. This is done by individual cutaneous testing with all available strains. Many laboratories, especially those interested in vaccine therapy for rheumatoid arthritis, have a large number, although usually not all, of the known strains on hand, which may be used for the determination of specific sensitivity. After the demonstration of cutaneous hypersensitivity to stock or mixed strains of streptococci, the patient

should be tested against all individual strains obtainable, and the final vaccine should be prepared from the specific strain or strains to which the patient shows the most pronounced sensitivity, rather than from a stock or mixed strain which may, however, be antigenically related.

The route of administration of streptococcus vaccine appears of some importance. It has been shown that the subcutaneous administration of streptococcus vaccine tends to increase and maintain the sensitivity rather than diminish it, while the converse is true when the vaccine is administered intravenously. Wainwright[11] has utilized this principle in the treatment of rheumatoid arthritis with streptococcus vaccine, giving the vaccine intravenously. This idea has been followed in the streptococcus vaccine therapy of the recurrent iritis associated with rheumatoid arthritis. The initial dose of the vaccine must be small and cautiously given, otherwise focal reactions will be produced in the eye. The results of such treatment have been gratifying. There are now in records of the Wilmer Institute a number of patients, all with the history of recurrent nongranulomatous iritis associated with rheumatoid arthritis, who have been under intravenous, streptococcus-vaccine therapy for periods up to seven years. The general result is the same—diminishing frequency and then freedom from attacks during the period of treatment. When treatment is stopped, however, recurrences in two to four months are not infrequent. Synchronous with the iridorelapse, there is usually a recurrence of the cutaneous sensitivity which had previously diminished or disappeared under the vaccine therapy. In several of these patients, continued weekly injections of the streptococcus vaccine appear to be the price of freedom from the attacks of iritis.

My only other experience with vaccine therapy for nongranulomatous iritis is with recurrent gonococcal iritis accompanied with a positive history of infection, a positive complement-fixation test with gonococcal antigens, and a positive skin test to gonococcus vaccine. Here the vaccine has usually been given subcutaneously. The majority of patients so treated appear to be benefited in the sense that the attacks occur at much longer intervals and are much less severe. The results, however, have not been as striking as those obtained with the streptococcus vaccine in iritis associated with rheumatoid arthritis.

Choroiditis. By far the great majority of cases of choroiditis belong to the granulomatous type, characterized by exudation, tissue destruction, and secondary gliosis. While granulomatous disease appears with equal frequency in the anterior and posterior uvea, nongranulomatous disease has an undoubted predilection for the anterior uvea. Why this should be so is not clear. Occasionally, cases of choroiditis are encountered in which the salient symptoms are marked subretinal edema, and an absence of visible exudates and tissue destruction. These cases usually run a short course and are not followed by secondary gliosis. I have seen several such cases which were clearly focal reactions following the diagnostic injection of injudicious amounts of tuberculin. I have not seen such cases in which a bacterial hypersensitivity to other organisms was demonstrated. If such cases occur, they are certainly rare. All that can be said, following the arguments presented for a hypersensitive nongranulomatous iritis, is that such a nongranulomatous choroiditis from bacterial hypersensitivity is a possible clinical entity, and careful observation may establish such a mechanism.

Granulomatous uveitis

Granulomatous disease affects both the

iris and choroid, and often the entire uveal tract. It may, therefore, be discussed as a single entity.

The evidence indicates that in granulomatous uveitis the various recognized, specific etiologic agents are present in living form in the uveal tract. In syphilis, this is certainly true. In tuberculosis, it is likewise almost certainly true. In experimental ocular tuberculosis, practically all the various clinical manifestations can be produced by inoculation of the eyes of properly prepared animals, and living bacilli can usually be demonstrated in such eyes long after all symptoms have disappeared. In the occasional spontaneous uveitis that occurs in animals systemically infected with tuberculosis, the bacilli can be demonstrated in the eye either by bacterial stains or by animal inoculation of the diseased eye. In some forms of clinical ocular tuberculosis, the bacilli can frequently be demonstrated by bacterial stains of sectioned eyes, and the inability sometimes to find them can probably be explained either on technical grounds or on the chronicity of the disease with final healing and consequent destruction of the bacteria. In lymphogranuloma venereum, the living virus is almost undoubtedly present in the ocular lesions, for in the characteristic oculoglandular conjunctivitis that frequently complicates the general infection the virus has been recovered from the conjunctival scrapings. In brucellosis, the bacteriologic evidence at hand indicates that living organisms are probably present in the ocular lesions, although their presence has not yet been conclusively demonstrated beyond shadow of doubt. Nothing can be said of sarcoid, for the specific causative agent, whatever it may be, has never been isolated and the etiology of the disease is a complete mystery. Nothing can be said of other possible etiologic agents until they are identified.

Influence of hypersensitivity in granulomatous uveitis

In syphilis a great deal is known of the influence of specific immunity on the occurrence of syphilitic lesions. The effect of such immunity on syphilitic lesions of the eye has been discussed elsewhere and need not be repeated here. Little or nothing is actually known of the effect of specific hypersensitivity on syphilitic lesions. The reason for this is that no antigen or syphilitic material has ever been discovered with which specific hypersensitivity can be effectively demonstrated. Any hypotheses on the subject are therefore, only by analogy and are little more than idle surmise. In brucellosis, the experimental study of the general disease and of ocular brucellosis, in particular, has not yet been sufficiently extended to warrant any conclusions on the influence of general or local hypersensitivity on the course of the lesions. What evidence there is indicates that both immunity and hypersensitivity may profoundly affect the course of the general and local disease.

There is little or no clinical or experimental knowledge of the effect of hypersensitivity and immunity in the uveitis produced by viruses and fungi. What we do understand, with reasonable clarity and certainty, is the influence of both hypersensitivity and immunity on the lesions caused by the tubercle bacillus. In this regard, both the general lesions of the disease and the lesions of ocular tuberculosis follow the same pattern. We may therefore use tuberculosis as an example to illustrate the effect of hypersensitivity and immunity in granulomatous uveitis.

The instillation of tuberculin in an already tuberculous eye may at times evoke a crop of phylectenules, and the systemic injection of excessive amounts of tuberculin may likewise cause a focal inflammatory reaction in a tuberculous eye. These are true hypersensitive reactions, they are

dependent on the previous sensitization of the eye by invasion of the eye by the bacilli, and are an example of the delayed reaction produced by the soluble portion of the tubercle bacilli when the eye has been previously sensitized by the protein of the bacterial body. Tuberculous lesions may also be produced by the injection of killed tubercle bacilli, and even by their fractions—tuberculolipides and especially tuberculophosphatide. But these lesions are nonprogressive, even in the nonimmune animal, and their extent is directly proportional to the number of bacilli or the quantity of lipides injected. Such lesions do not concern us clinically. The point to be emphasized is that true progressive tuberculous lesions, with cellular infiltration of lymphocytes and epitheloid cells, tubercle formation, and caseation or encapsulation, are produced only by the actual invasion of the eye with tubercle bacilli and the presence of the bacilli in the eye in living form. The course of the lesions resulting from such bacterial invasion is profoundly modified by the factors of immunity and tissue hypersensitivity, but hypersensitivity to tuberculo-protein *per se* does not produce characteristic tuberculous lesions, notwithstanding the innumerable statements to the contrary with which ophthalmic literature fairly bristles. It is, therefore, incorrect to speak of "allergic tuberculous lesions;" or to say that certain specific ocular lesions (excluding phylectenules and focal reactions) are "caused by allergy." The lesions are caused by invasion of the ocular tissues by the tubercle bacilli. The course and character of the lesions is modified and influenced by the factors of immunity and tissue hypersensitivity.

In what manner do hypersensitivity and immunity modify and influence the course of tuberculous lesions? This can best be illustrated by following the course of ocular tuberculosis in experimental animals, for here the picture simulates the clinical disease with amazing faithfulness.

If a normal nontuberculous rabbit is inoculated in the anterior chamber with virulent human tubercle bacilli, there is practically no immediate reaction. With the usual dose of organisms, small hard tubercles develop on the iris, in the cornea, and in the ciliary body in about two weeks. There is only a minimum inflammatory reaction. As the bacilli propagate and the tuberculous lesions multiply, the picture gradually changes. In about four to six weeks after inoculation, the inflammatory reaction increases; evidences of caseation appear with necrosis of the involved cornea and sclera; and somewhere about the 12th week the eyes usually perforate. If sample rabbits from such an experiment are tested from time to time for sensitivity of the eye to tuberculo-protein, it is found that the development of acute inflammation, caseation, and necrosis parallels the development of the hypersensitivity to the tuberculo-protein.

When the eyes of rabbits which have had a previous systemic tuberculosis (immune-allergic animals) are similarly inoculated, the picture is quite different. As a result of the old systemic infection, such rabbits have developed a generalized hypersensitivity of all the body tissues, including the eyes, to tuberculin. At the same time they have developed a greatly increased resistance to reinfection, although there is no relation between the hypersensitivity and the immunity. This resistance to reinfection may be so great that it requires many times the dose given normal rabbits to produce ocular lesions. When the necessary dose of bacilli is injected into the anterior chamber of these rabbits, an acute inflammatory reaction develops in 24 to 48 hours. This reaction lasts for several days. This is the local reaction to the tuberculin in the inoculum and is dependent on the ocular hyper-

sensitivity which has occurred as part of the general sensitization. This reaction subsides within a week, and thereafter there is a latent period of several weeks without symptoms. Hard tubercles then slowly develop in the iris, cornea, and ciliary body. However, these lesions do not increase in size nor progress to the extent they do in the normal rabbit. The inflammatory reaction is usually of low degree, there is very little caseation and necrosis, and these eyes rarely if ever perforate. The entire course of the local disease is restrained, and after three to four months, the process burns out with moderate scarring and damage to the eye. If the eyes of sample rabbits from a series of such animals are examined for local reactivity to tuberculo-protein, it will be found that there is only a very moderate increase in the local reactivity and the degree of inflammatory reaction and tissue destruction in the eyes parallels the degree of local hypersensitivity.

This fundamental principle, that inflammation, caseation, and necrosis parallel the degree of local-tissue reactivity to tuberculo-protein, can be illustrated in various other experiments. For example, rabbits develop varying degrees of hypersensitivity to tuberculo-protein after systemic infection. Thus when the eyes of animals with a low sensitivity are inoculated with tubercle bacilli only minimal inflammatory lesions result; while if the eyes of animals with high sensitivity are selected, much more pronounced inflammatory symptoms result. Similarly, if hypersensitive rabbits are desensitized with tuberculin prior to inoculation of the eyes, there is almost no inflammatory reaction to the tuberculin in the inoculum, and any later inflammation or caseation is proportional to the degree of local hypersensitivity which the eyes later again develop as a result of the local infection.

Just as different rabbits develop different degrees of tissue hypersensitivity after systemic infection, they likewise develop different degrees of immunity. When a series of rabbits with systemic tuberculosis is inoculated in the eyes, some develop no symptoms whatsoever, while others develop ocular lesions after widely varying inoculation periods. Some require huge doses of bacilli to evoke ocular lesions, while others develop lesions after a relatively small dose of bacilli. In rabbits with low immunity, the tuberculous lesions usually spread throughout the eye, and with the spread of the lesions increased local hypersensitivity develops. As a consequence, there is an increased inflammatory reaction with greater tendency to caseation and necrosis. In rabbits with high immunity, the lesions are much smaller, show little tendency to spread, run a shorter course, and heal comparatively quickly.

Thus by studying large numbers of systemically infected rabbits which have later been inoculated in the eye, the factors that modify the course and character of ocular lesions become apparent. If the immunity is high and the tissue hypersensitivity is low, minimal lesions result, with little inflammatory reaction, and such lesions usually become quickly encapsulated. On the other hand if the immunity is low and the tissue hypersensitivity is high, spreading inflammatory lesions result, with caseation and necrosis. Various fluctuations between these two extremes produce the intermediate chronic type of reaction.

I have spoken of "local" tissue hypersensitivity, meaning the hypersensitivity of the tissues of the eye and not the general cutaneous or systemic hypersensitivity. In experimental animals, the local ocular sensitivity can be readily determined by injecting measured amounts of tuberculin or purified protein derivative into the eye, estimating the ensuing in-

flammatory reaction, then enucleating the eye and evaluating the histologic reaction. Unfortunately in patients, there is no safe way of estimating this ocular sensitivity. From experimental studies, it has been clearly demonstrated that in a tuberculous eye, there may be no parallelism between the local ocular reactivity to tuberculin and the cutaneous reactivity. The local disease in the eye may produce a high degree of local ocular reactivity, while the cutaneous sensitivity remains low. The tuberculous process in the scleral envelope is insufficient to affect profoundly the cutaneous sensitivity. However, if the cutaneous sensitivity is high, the ocular sensitivity is likewise high, for the eye participates in the general tissue reaction.

In the study of clinical ocular tuberculosis, we are handicapped by this inability to determine the degree of local ocular hypersensitivity. All that can be determined is the degree of cutaneous sensitivity. If this is high, then the ocular sensitivity can safely be assumed to be high. But if the cutaneous sensitivity is low, the ocular sensitivity may be much higher, influenced by the local disease. The degree of ocular sensitivity in such cases can be estimated only by studying the degree of inflammatory reaction, and searching for evidences of caseation and necrosis, which are the concomitants of local tissue sensitivity. Yet, despite this handicap, when cases of clinical ocular tuberculosis are studied over a period of years, they appear to follow the same general pattern of experimental lesions.

Thus in infants and children, ocular tuberculosis is characterized usually by a high degree of hypersensitivity and a low immunity. A tuberculous choroiditis in a child or in the Negro (in whom the tuberculous process generally is of the infantile type) usually spreads rapidly and tends to involve the entire fundus with extensive caseation and tissue destruction. Tuberculosis of the anterior uvea usually is of the same severe type. In children with a miliary tuberculosis, tubercles on the iris and choroid are not uncommon. These children may be so ill that they are unable to develop any tissue response to the invading bacilli, and there may be little inflammatory reaction around the tubercles. But if these children are hypersensitive or if they do not die from the generalized infection and bacillemia, and later develop hypersensitivity, then the iris tubercles undergo an inflammatory reaction, increase in size, coalesce, and there is caseation, tissue necrosis, and often actual perforation of the eye.

In young adults or older patients in whom a general systemic immunity of varying degree has developed but in whom tissue hypersensitivity may still be high, tuberculous lesions such as sclero-keratitis run a typical course of attacks of acute inflammation, but tend to be walled-off, self-limited, only to recur again and again as the resistance fluctuates. Tuberculous periphlebitis with the recurrent vitreous hemorrhages is usually a disease of early adolescent life and is usually accompanied by a high degree of sensitivity to tuberculin.

What histologic evidence there is indicates that the so-called "circumscribed plastic choroiditis" is a localized tuberculous lesion. It occurs usually in adults and is characterized by single exudates near the posterior pole of the eye which quickly become circumscribed and walled-off. In such patients the cutaneous sensitivity to tuberculin is usually moderate or low. The course of the choroidal lesion, with an absence of surrounding inflammatory reaction, with rapid walling-off and gliosis, suggests the local tissue sensitivity is also low, while the immunity of the patient is high. In short, in individuals with high sensitivity and low immunity, the lesions of ocular tuberculosis are

characterized by high inflammation, invasive tendency, and tissue destruction; while in individuals with low sensitivity and a well-developed immunity, the lesions tend to be minimal, are attended with little inflammatory reaction, and are rapidly encapsulated. The long drawn-out, chronic, fluctuating lesions are indicative of both moderate resistance and hypersensitivity.

If we grasp the underlying principles which determine the character and course of tuberculous lesions of the eye, the therapeutic indications are clear. They are: (1) to enhance the resistance of the patient to the disease; and (2) to abolish the tissue hypersensitivity. Unfortunately, there is no direct way to increase the immunity, for artificial immunization is still much of a sought-for dream. General hygienic measures are still our main resource. Desensitization with tuberculin is a long and laborious process, often difficult and sometimes impossible to accomplish, and when once accomplished can usually be maintained only by continued tuberculin treatment over years. Yet unsatisfactory as these procedures may be, they are still the cornerstones of the treatment of ocular tuberculosis.

Conclusions

I have endeavored to point out the clinical differences between two types of uveal disease, nongranulomatous and granulomatous. Both types are dependent on invasion of the eye, at one time or another, by living bacteria, but the pathogenesis and character of the lesions in these two types of uveal disease, appear to be quite different. In the nongranulomatous type, the primary invasion of the eye is probably by organisms either of low virulence or in small numbers. The result is that they are destroyed by the normal bacteriocidal action of the ocular fluids. This primary invasion produces either insignificant lesions or no lesions at all, but it does produce a local hypersensitivity of the ocular tissues either to the bacterial protein or to the soluble bacterial products. This hypersensitivity may be of the bacterial type, or of both the anaphylactic and bacterial type. When the bacterial antigens again reach the eye, either through reinfection or absorption from an infected focus or even a normal cutaneous or mucous-membrane surface, there results a hypersensitive reaction in the eye. This reaction is produced either by organisms which do not proliferate, or by their bacterial products. In either event, the reaction is essentially an evanescent one and is characterized by an intense vascular congestion and a minimum of tissue damage—the picture of a nongranulomatous uveitis.

In the granulomatous type of uveitis, the mechanism is quite different. The organisms reaching the eye are not destroyed, but remain viable in the ocular tissues, and by their presence, proliferation, and inherent toxicity, produce local lesions in the eye. The character of the resulting lesion is profoundly modified and influenced by the factors of local hypersensitivity and general immunity. The proliferation of the organisms in the eye produces a local hypersensitivity to the bacterial products. This hypersensitivity is of the bacterial type, and a reaction between the hypersensitive tissue and the bacterial products may thereafter result. If the proliferation of the bacteria is not restrained by the forces of immunity, this hypersensitive reaction will be progressive, characterized by inflammation, caseation, necrosis, tissue destruction, and often a compensatory overgrowth of granulomatous tissue. If however, there is present either a natural or an acquired resistance to the infection, the proliferation of the bacteria is restrained and the reaction is minimal.

I have used tuberculosis as an example to illustrate the influence of hypersensitivity and immunity in granulomatous uveitis. I realize fully that there are many peculiarities of the tubercle bacillus which differentiate it sharply from nonacid-fast pathogenic organisms and open the door for the criticism that the general laws which influence tuberculous lesions may not be applicable to disease caused by other bacteria. Yet, I do not believe this to be true. I believe the same general principles of resistance to infection and tissue hypersensitivity, which have been so extensively studied in tuberculosis, will likewise apply, with minor variations, to the lesions found in other infectious granulomatous diseases. This can be determined only through further animal experimentation and clinical observation. Our knowledge of resistance and hypersensitivity and their influence on local and systemic disease has broadened greatly in the last few decades, but there is still much to be learned. If we approach the problem of the etiology of uveitis with an orderly concept of the underlying principles of infection, resistance, and hypersensitivity, as they are now known and may later be amplified, I believe the influences of these fundamental tissue reactions will be demonstrated, not only for the present known causes of uveal disease, but also for other etiologic factors which yet remain to be discovered.

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A CONTRIBUTION TO THE KNOWLEDGE OF OCULAR SIDEROSIS AND POSTERIOR DEGENERATIVE PANNUS*

PART I OF THE RESEARCH IN INDUSTRIAL OPHTHALMOLOGY

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It has been generally accepted, since Leber published his classical investigations, that an intraocular iron splinter is partly converted by the carbonic acid of ocular fluids into one or more diffusible compounds.

When the experiment is carried out on rabbits' eyes, the compound, bicarbonate of suboxide of iron, is precipitated (possibly by oxygen in the tissues) both near the foreign body (direct siderosis), and also at a distance (indirect siderosis).

Even the best microscopic reagent at our disposal (Perls's hydrochloric acid and potassium ferrocyanide) does not reveal all the iron present, as a further portion combined with protein is not stained as Prussian blue.

Examination of a siderotic retina, stained in bulk by Perls's method, reveals not only beautiful blue patches, but a rash of brown patches which may contain masked iron, melanin, or both.

Certain tissues of the eye may have a selective affinity for different chemical compounds. Elastic fibers, for instance, are argyrophil, as Loewenstein (1941) has shown in the tissue of the argyrotic tear sac; copper, too, is localized to certain tissues of the globe in chalcosis bulbi; while Wolff (1934) has suggested that all living cells will absorb iron in varying degrees, glass membranes being the least absorptive of all.

The literature on siderosis is already extensive, and we only feel justified in publishing our case in detail, because we have observed tissue changes which lead to general conclusions. The discovery of some of these changes is due to the employment of methods frequently neglected by the majority of investigators.

The patient, a fitter aged 40 years, who had never worked as a smith or been unduly exposed by his occupation to infrared radiation, was first seen in 1935. He was then applying for a Civil Service post, and stated that his left eye had been blinded by an intraocular steel splinter which was "removed by operation" shortly after the accident in 1923. The eye showed no visible perforating scar, but had characteristic rusty changes in the iris, and brownish spots at the anterior surface of the cataractous lens. The vision amounted to good projection of light only.

The patient was told that excision might eventually be necessary, but that this would not be essential so long as the eye was free from inflammation. The eye remained quiet until 1944, when he had attacks of pain lasting a week at a time.

He finally came for treatment in September, 1945, with a severe iritis and hypopyon, which had lasted three weeks. The eye was then acutely inflamed and blind. The cornea was edematous, the anterior chamber contained a hypopyon and a supernatant brownish fluid. The iris, a deeper brown than before, was tremulous —the cataract having disappeared from the pupil.

The right eye had at all times been completely normal. After excision under local anesthesia, the siderotic eye was fixed in formalin.

* From the Tennent Institute, Glasgow, Prof. W. J. B. Riddell, Director. Sponsored by the W. H. Ross Foundation (Scotland) for the study and prevention of blindness.

Frontal division of the eye revealed an opaque and shrunken lens floating freely in a fluid vitreous. A metallic foreign body was firmly embedded (6 mm. from the limbus) as is shown in the natural size stereophoto (fig. 1). The visible portion measured 0.75 x 2.5 x 2 mm. The foreign body was removed without difficulty prior to embedding the eye in celloidin. An oval defect of the iris tissue was revealed by diaphanoscopy, marking the track of the foreign body into the interior of the globe.

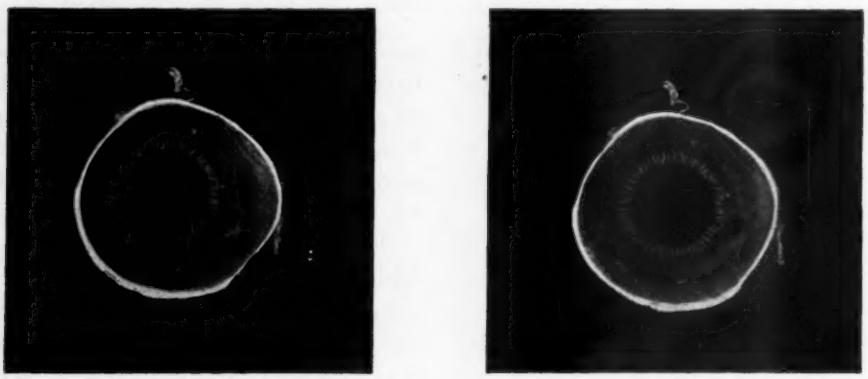

Fig. 1 (Loewenstein and Foster). Stereophotograph of the foreign body in situ. Anterior half of the eye.

Slitlamp examination of the posterior half of the opened eye showed thin retinal vessels and that the macular area was the site of water-clear cysts, whose elevation was clearly demonstrated by the narrow beam.

Many pieces of the peripheral retina and choroid were excised for examination in bulk, while the horizontal area, about 8 mm. broad, containing the disc and macula, was embedded in celloidin.

The corneal epithelium was abraded at many points (artefact), and Bowman's membrane was marked by dark round corpuscles in the hematoxylin and eosin slides. In the periphery these were isodiametric about 0.25 to 0.5μ. Toward the center the granules were thicker about 1μ in diameter, and occurred more frequently (fig. 2). A few granules were found in the superior corneal lamellas. Toward the epithelium the granules were generally denser than they were basally (fig. 2).

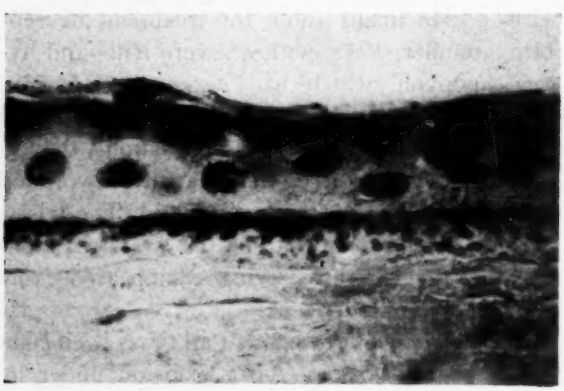

Fig. 2 (Loewenstein and Foster). Siderosis of Bowman's membrane.

Perls's Prussian-blue reaction showed a fine blue haze in the epithelium and that these corpuscles were ferric. Their size was the same in sections stained by hematoxylin, Perls's method, or by the two methods combined.

The corneal corpuscles were clearly visible and neither shrunken nor edematous. The corneal

corpuscles, Descemet's membrane, and the endothelium were iron free and normal, if one excepts a few macrophages and neutrophil leukocytes adhering to the endothelium.

The hypopyon contained plasma cells in addition to macrophages, neutrophil leukocytes, and pigment, both free and in macrophages. A moderate number of eosinophils were present (fig. 3). While the macrophages contained both Prussian-blue particles and a brownish-yellow pigment, the reticulum cells around Schlemm's canal contained a modest amount of blue particles only.

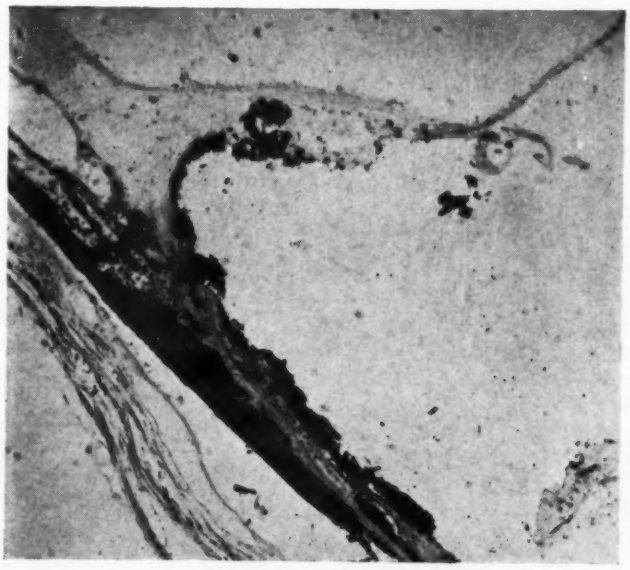

Fig. 4 (Loewenstein and Foster). Section through the pars plana and of the ciliary body near the site of the foreign body. This shows primary siderosis and deep-blue plaques in the thickened retina with Perls's reaction.

Some of the limbus vessels were "cuffed." The trabeculum contained a scattered mass of red blood corpuscles, which stained well with eosin.

There was an intensive patchy infiltration of the iris tissue, and the vessels were dilated and engorged. The infiltration consisted almost entirely of plasma cells, although some macrophages with a coarsely granular protoplasm were found superficially.

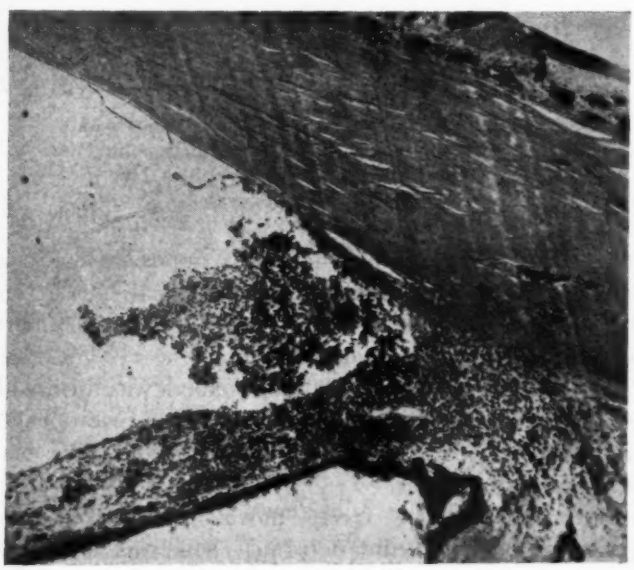

Fig. 3 (Loewenstein and Foster). Tough hypopyon with cellular infiltration of the iris and ciliary body.

In the ironstained slides, a large amount of blue granular tissue could be found between the pigmented layer and the clearly visible dilator fibers, infiltrating the latter. Some of the latter showed iron granules as well.

The ciliary body showed far less inflammatory cellular infiltration. With Perls's reaction, there were many fibroblasts filled with blue granules. There were polygonal reticulum cells in the corpus ciliare containing even larger granules. A considerable amount of iron was free in this area, and large poly-

hedric cells like mast cells were crammed with dark-blue masses. Both the pigmented and unpigmented epithelial layers showed patches of iron at certain places, and a fine blue powder at others. The ciliary body contained a multitude of eign-body giant cells were found. Here were iron-laden fibroblasts, neutrophil leukocytes, and macrophages, some of which had engulfed iron material.

At the side where the foreign body was situated, no trace of zonular fibers could

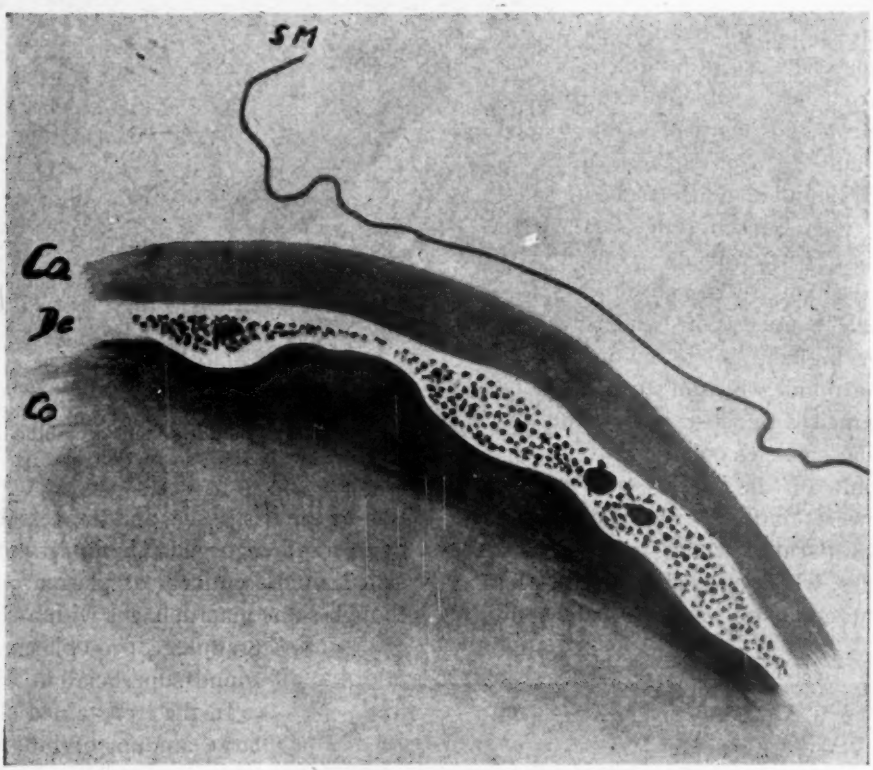

Fig. 5 (Loewenstein and Foster). Lens capsule, Perls's reaction (oil immersion). The capsule is iron free, as is also the split-off lamella. The subcapsular epithelium contains a fair amount of iron granules. The nuclei stained a very dark blue. SM, split membrane. Ca, capsule. De, degenerated epithelium. Co., corticalis.

ragged blue patches. Some swollen cells with round nuclei on the posterior iris surface contained dark, round inclusions.

At the site of the foreign body the scleral fibers were irregular, and broken up plaques—Fe+Ca—were present (fig. 4). These were probably broken in the removal of the foreign body prior to the embedding. Between these layers an eosin-red, hyaline mass was present, extending into the vitreous space. No for-

be found; while at the opposite side, some broken-up, glassy, preretinal fibers were visible in a position suggesting that they corresponded to zonular fibers. The space between these glassy fibers was filled with small, thin cells and with macrophages containing small brown and (iron) blue bodies.

The freely movable, shrunken, and markedly deformed lens was embedded separately in paraffin, and sectioned me-

ridionally. The subcapsular epithelial nuclei were irregularly distributed and broken up (fig. 5). A lens capsule of variable thickness covered the entire lens and was split most markedly where it was the thickest, presumably the anterior pole (figs. 6a and 6b). There were brownish granular masses between the capsule and the irregular flat nuclei of the epithelium. A layer of subepithelial tissue less than 8μ thick stained eosin red, but the remainder of the lens matter was a loose purple-stained granular mass.

The lens capsule showed under high-power magnification (× 1,350) an anterior lamella of a purplish-pink color (fig. 6a) which could be seen overlying another lamella of equal thickness but unstained. The split membrane (fig. 6c) was continuous with the more anterior of these layers. Where this membrane floated in front of the lens, this unstained lamella was absent from the lens itself.

The choroidal vessels were broader than usual, but there was no sign of posterior-choroidal infiltration except toward the periphery, where the choroid consisted of pigmented scar tissue fused with the retina. There were some groups of plasma cells and thickening of the pigment of the suprachoroid. The hexagonal cells were paler than normal, and the pigment, which was scattered in the central area, was aggregated toward the periphery. There was no visible break in Bruch's membrane which was very thick near the disc. The opacity of this thick area suggested the fatty degeneration frequently found in degenerated eyes.

The wavy appearance of the thickened, inner-limiting membrane near the macular area was not just a postmortem appearance, as the crests of the waves were linked by membranes consisting of fibroblasts, lymphocytes, and macrophages (fig. 7). The valleys between these crests were filled by neutrophil leukocytes, red blood corpuscles, and ghost cells. The same cells were visible in front of the

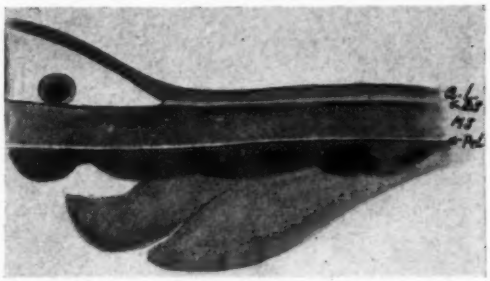

Fig. 6a (Loewenstein and Foster). Siderosis of the lens capsule (×1,350). One fifth of the capsular thickness is split off. There are clearer spaces; one beneath the split lamella and a similar one at the posterior delineation. These clearer lamellas can be followed over considerable distances. A.L., anterior lamella. DS, delineation space. MS, Main substance. Pd, posterior delineation space.

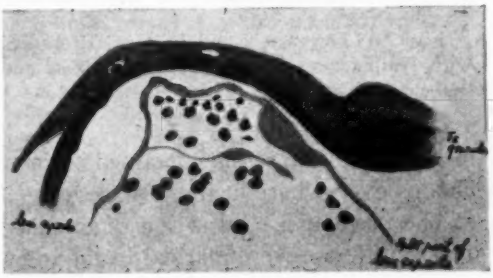

Fig. 6b (Loewenstein and Foster). The lens capsule split over a large area. The split lamella is cut partly flat. (H.E.×300).

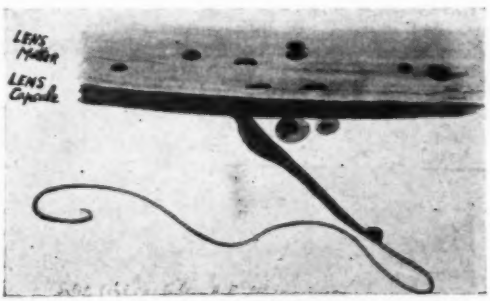

Fig. 6c (Loewenstein and Foster). Split lens capsule.

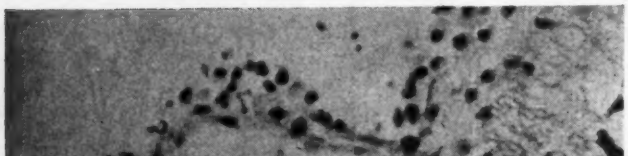

Fig. 7 (Loewenstein and Foster). Preretinal bands covered with lymphocytes and macrophages. Note the swollen ganglion cells.

membranes. The retina contained pigment clumps everywhere in the periphery.

The macular area was full of exudates (fig. 8). These were marked in the internuclear layer and pressed the fibers of Henle's layer apart. These fibers were very curved, and there were often only a few present between the eosin-red exudates (fig. 9).

The staining of the exudates was unequal—some were stained a bright eosin red; others were paler. The larger exudates contained, as a rule, oval-shaped, empty spaces, corresponding to fatty enclaves. Since some of these fatty ovals still showed a dark purple nucleus and a granular mass, there was no doubt as to their origin from fat-phagocytizing (probably hexagonal) cells.

The macular exudates had expanded the retina to twice its normal thickness. Some of these exudates were directly beneath the internal-limiting membrane (see fig. 8). Where present, they had destroyed the regular scaffolding of the retina and altered the order of the layers. Contraction of the deep exudates had even led to a folding of the posterior retinal surface.

The ganglion cells at the macula were particularly noteworthy, being sparse and of great size (fig. 10). The nuclei resembled those of the internal nuclear layers in size, but the protoplasm was three or four times as large as normal, stained with eosin and foamlike (fig. 10).

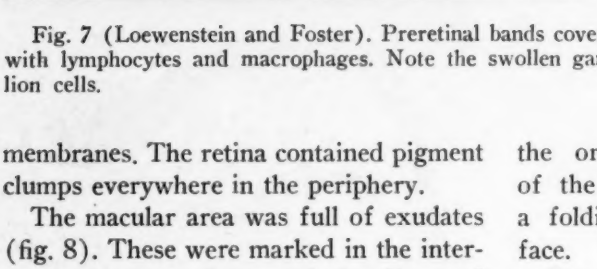

Fig. 8 (Loewenstein and Foster). Cystic macular degeneration.

Slightly to the temporal side of the macula, the retina showed very few intact ganglion cells. The thickened eosin-red Mueller's fibers stood out sharply. In the outer molecular layer nearer the periphery, the layers became irregular. Glial fibers often accompanied by pigment cells traversed the whole retinal thickness in an oblique fashion. Midway between the disc and the ciliary body, heavy sub- and

intraretinal patches of pigment occupied the destroyed retina. A thick layer of pigmented masses and a criss-cross of glial fibers were left. The retina and choroid became fused long before the ora serrata was reached. The neuro-epithelium was absent for the most part, as in pigmentary retinal degeneration.

A flat plaque of nerve fibers and glial nuclei filled the concavity of the curved cribriform plate. Immediately behind the lamina cribrosa was an area of cavernous degeneration, absent from the posterior part of the optic nerve.

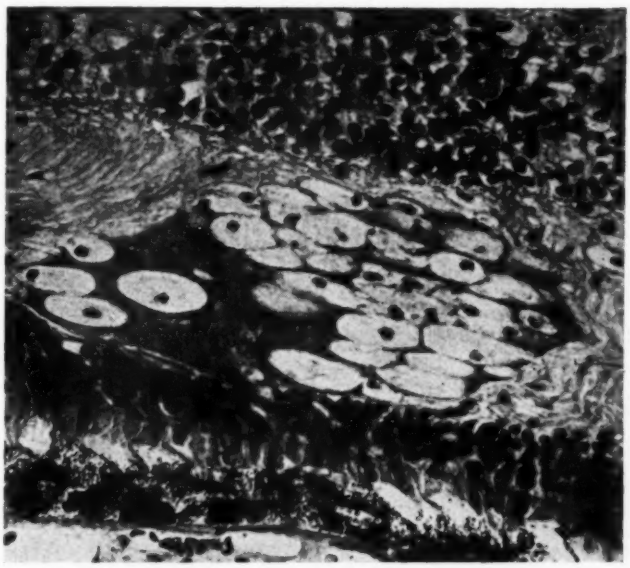

Fig. 9 (Loewenstein and Foster). Cystic macular degeneration. Eosin-red exudate in the outer molecular layer with fatty corpuscular cells. Müller's fibers bend outward.

The endothelium of the arachnoid was markedly thickened, and the arachnoidal space was increased in size. A perfect corpus arenaceum powdered with lime was visible. This contained no iron.

Iron staining showed that there was no iron in the optic nerve and very little in the posterior part of the retina. Iron corpuscles were found nearer to the disc at the nasal side than at the temporal. The cystic area was practically iron free. While there were free, small, round iron corpuscles, the majority formed dark-blue intracellular patches. These exudates and the huge edematous ganglion cells were iron free.

The more peripheral the retina, the more degenerate it was, and the denser were the dark-blue patches. In addition, there were many light-blue lines and very fine granules (probably adsorption phenomena) at the surface of the individual cells.

The surface of the unstained exudates in the periphery (smaller than those in the macular area) showed a definite blue line. Except for isolated choroidal chromatophores and single hexagonal cells, there was little iron staining in the choroidal sections.

Even where the retina and choroid were indistinguishably fused, the blue retina showed diffuse siderotic changes; while in the pigmented choroid, single blue patches and single iron-filled cells of the chromatophore type only were visible.

Retina and choroid in bulk

One's first impression on examining the inner side of the unstained retina in bulk was that of a dense fibrous tissue in

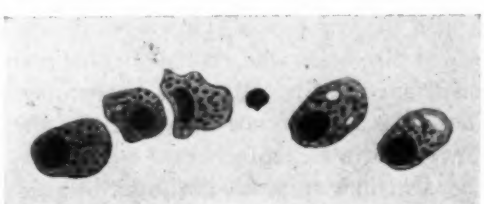

Fig. 10 (Loewenstein and Foster). Siderotic ganglion cells of the retina. Note vacuolation.

which both fine and coarse brownish-yellow pigment patches were visible. Heavy brown and black patches were isolated by fibrous tissue running concentrically round them (fig. 11). These pipelike spaces could be observed through the entire thickness of the retina. The most striking view was obtained by examination of the retina in bulk from the outer surface. Irregular, broad, stripelike bands divided the patchy, pigmented area. In the retina in bulk, stained with scarlet red, brownish patches outlined the course of these vessels which formed a regular network of shiny red bands. These were approximately equal in breadth, the largest being 45 to 50 mm. wide (fig. 12a).

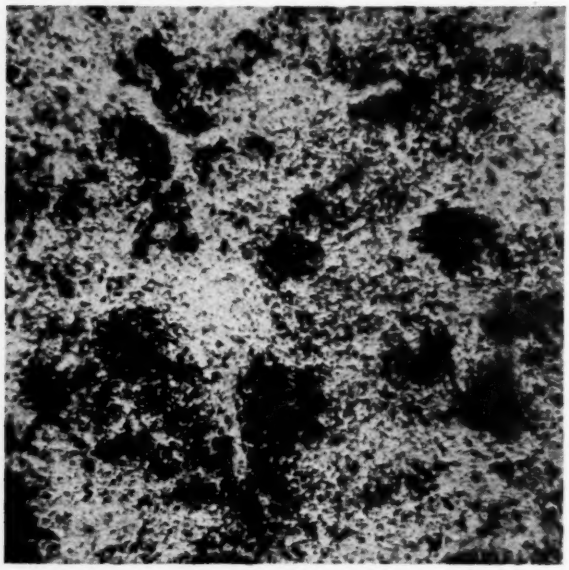

Fig. 11 (Loewenstein and Foster). Retina in bulk. Unstained. Examined from the choroidal aspect. Note the dark, brownish retinal patches in all layers and the bands surrounded by pigment. The majority of the pigment patches are dome-shaped and are situated in empty spaces. The unstained bands may be identical with the fatty vascular network (posterior pannus, stained red with Sudan 3).

High-power magnification showed the bands to be lined with darker red patches parallel to their course. This network was located 50μ below the retinal surface and was limited to the retinal periphery only. There was no evidence in any part of the network of a lumen or blood corpuscles. The distribution, particularly the branching, was reminiscent of a vascular system.

The major portion of this network remained at the level of the outer retinal surface and its conglomerate hexagonal cells. Cross sections through peripheral retinal tissue showed these empty endothelial structures at the posterior retinal surface. A granular exudate in front of Bruch's membrane contained eosinophilic granules (fig. 13). It was vascularized and disintegrating, and corresponded to a posterior pannus. There was a certain similarity to the process of disciform macular degeneration in which capillaries from the choriocapillaris migrate through a break in Bruch's membrane.

The entire peripheral retinal tissue was a bright Prussian blue in which there were dark-blue patches corresponding to the dark-brown ones visible in the unstained retina in bulk (fig. 14). These blue patches were insulated by concentric glial bands. Many of the dark-blue patches contained a quantity of brownish elements (fig. 14) in which the iron molecule might be masked by a protein compound.

Similar structures could be found stained scarlet red in the choroid in bulk (fig. 15). Situated at the level of the hexagonal cells, they overlaid the regular ar-

rangement of the larger choroidal vessels. At some points their regular width was interrupted by an isthmuslike narrowing. The plane of these structures was about 30 to 35μ beneath the chromatophore network in the suprachoroid. Here and there, however, conglomerations of hexagonal cells obscured the red network.

Many suprachoroidal chromatophores were filled with a mixture of pigment and fat granules; in others the processes were outlined by shining red fatty droplets.

When the choroid was stained for iron in bulk, the majority of the hexagonal cells, whether intact or damaged, were iron-free. In the periphery, however, there were hexagonal cells, isolated or in groups, which contained iron granules. Some choroidal reticulum cells were filled with blue corpuscles.

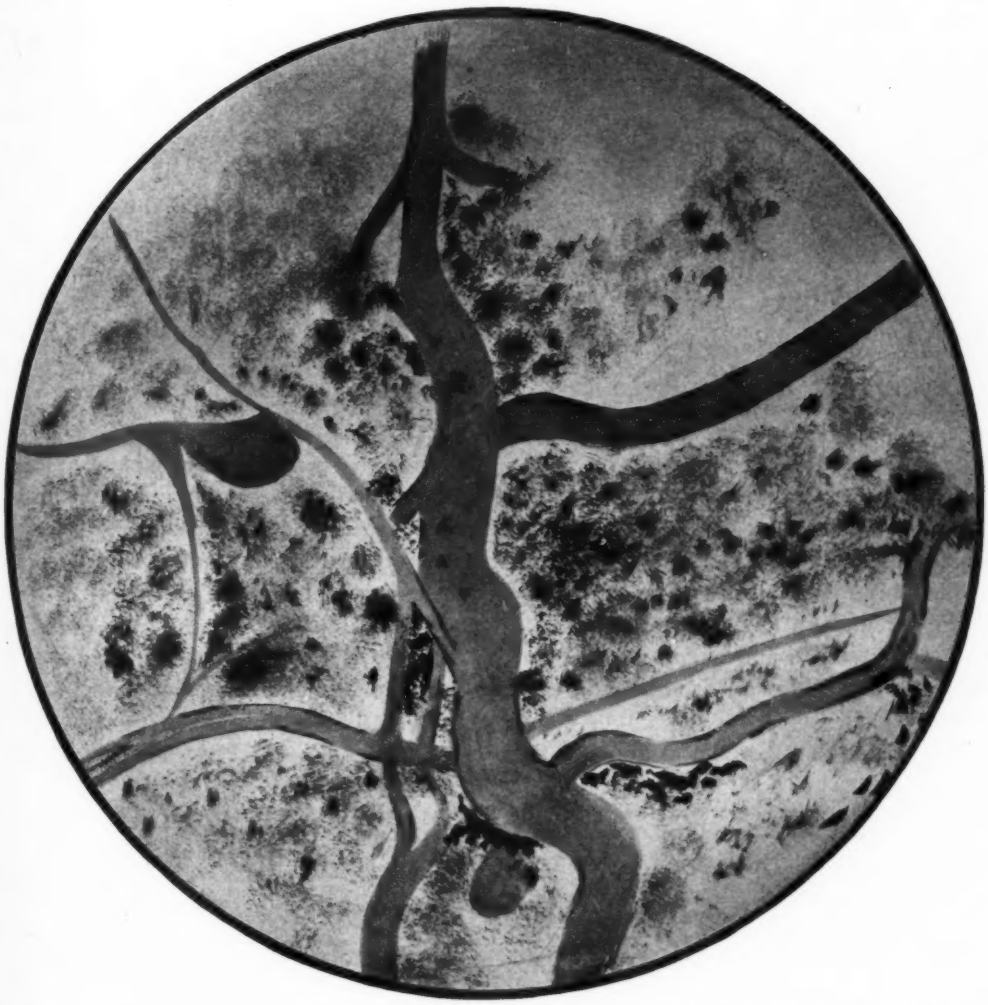

Fig. 12a (Loewenstein and Foster). Siderosis. Retina in bulk stained with scarlet red and examined from the outer surface (×60). The fatty vascular network, stained shining red with scarlet red is partly covered by degenerate hexagonal cells. The fatty cells and irregular branching of the vessels should be noted. The pigment of the hexagonal cells is partly brown and partly black, like Chinese ink.

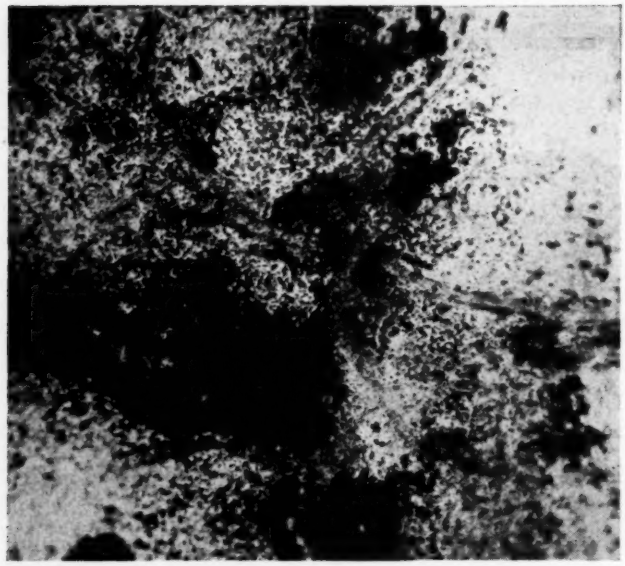

Fig. 12b (Loewenstein and Foster). Retinal periphery (×300 H.E.). This section includes bands which may correspond to the fat-stained filaments in the retina in bulk. The red bands do not show up so well as in Figure 12a which was drawn through the microscope.

Discussion

The symmetrical and equal distribution of the iron-containing corpuscles over the whole of Bowman's membrane, in spite of the lateral position of the foreign body, suggested that the distribution must have been via the blood and lymph streams and not by direct diffusion from the foreign body.

It was possible that the location of the spherical bodies within Bowman's membrane was the expression of a reduced metabolism in the injured eye, similar to that associated with band-shaped corneal degeneration (Loewenstein, 1946).

Since the hypopyon contained only a moderate number of polymorphs and many macrophages and plasma cells, it was a chronic condition. Clinically such an hypopyon might be expected to be

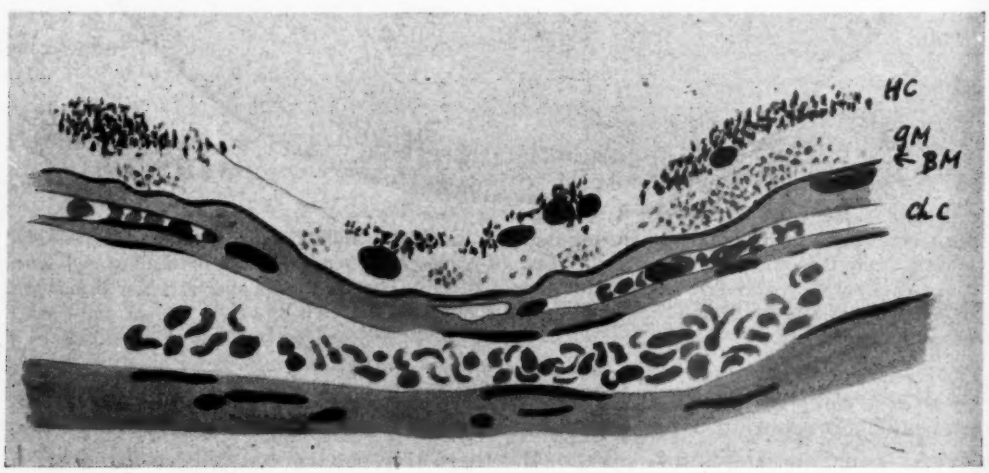

Fig. 13 (Loewenstein and Foster). Granular mass located between Bruch's membrane and hexagonal cells may originate from the posterior pannus. (H.E. oil immersion). HC, hexagonal cells. GM, granular mass. BM, Bruch's membrane. ChC, choriocapillaris.

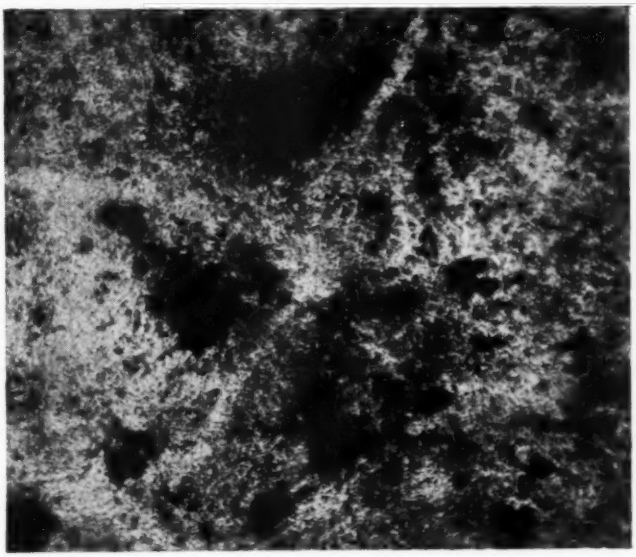

Fig. 14 (Loewenstein and Foster). Retina in bulk stained for iron by Perls's method. The dark patches are blue with many brownish foci. The lines correspond to the fatty network of the posterior pannus.

tough and firm. Its macroscopic appearance did, in fact, bear this out.

The scattered red corpuscles in the pectinate ligament were an unusual finding, as they showed no further signs of disintegration. Certainly there was nothing here reminiscent of the blockage of the ligamentum pectinatum which led to glaucoma in Erdmann's well-known experiments with electrolytic iron in the rabbit.

If the generally accepted view that iron is dissolved in the aqueous is correct, then it was extraordinary that the endothelium and Descemet's membrane should remain iron-free, although bathed for years in this solution. It is also difficult to explain why, when Descemet's membrane remained free from iron, Bowman's membrane should store it. *A priori,* one would expect the contrary.

It is possible that the calcium granules in Bowman's membrane were the sequel of chronic uveitis and that this might provide a nidus for the absorption of iron.

The plasmocellular iris infiltration was obviously a chronic change and, as suggested frequently in earlier papers, was reminiscent of an infectious granuloma (syphilis, for instance). The iris infiltration was unrelated to the site of the foreign body, as the plasma-cell infiltration, although patchy, was equally distributed.

The large mononuclear cells in the vitreous resembled those found in sympathetic ophthalmia. Since the majority of them were iron-free, they may have been an expression of longstanding irritation only.

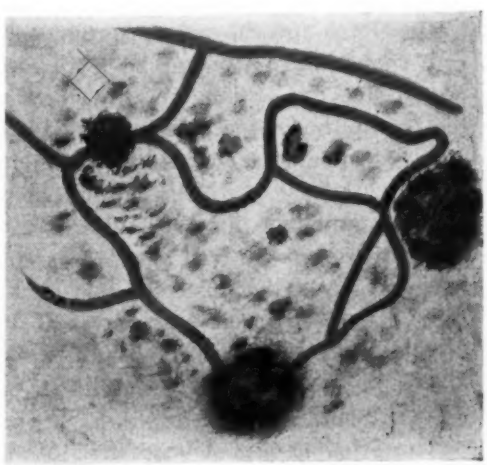

Fig. 15 (Loewenstein and Foster). Choroid in bulk stained by scarlet red. Examined from retinal aspect (×150). The network of reddish bands is about 8 to 12μ broad.

In our case, there were wide areas over which the lens capsule had split off. This split glassy membrane was either loose or, where attached, arose at a sharp angle from the lens capsule. This splitting was in no sense radiational, as in fireworkers cataract, and was probably due to the toxic process. It is possible, in its etiology, it could be compared to senile exfoliation of the lens capsule, a condition whose pathology has not yet been completely investigated, and which may also be due both to failure of the intraocular metabolism and to toxic products.

The split was too extensive and the lamella too thick to be identified with Berger's zonular lamella. It is not impossible that there may be an unrecorded stratification in both the anterior and posterior capsules of the lens which would provide an anatomic basis for the breakaway of the anterior lamella, both in this case and in cases of fireworkers cataract.

The center of the shrunken lens contained a dark-purple mass, which might have been calcium phosphate, as hydrochloric acid dissolves it but does not evolve any bubbles.

The optic nerve and the posterior part of the retina and choroid were practically iron-free. The entire retinal periphery, not merely the peripheral retina around the foreign body, contained absorbed iron particles. The change was, therefore, independent of the site of the foreign body.

It is significant that there was no evidence of iron in the cystically degenerated macular area. We must conclude, therefore, that the macular disease was an indirect sequel of the intraocular foreign body and might have been due to the cyclitis present.

The swelling and degeneration of the macular ganglion cells was secondary, as was the overall reduction of the number of ganglion cells in the area where no iron was detectable.

The destruction of the peripheral retina would appear to have been a direct toxic effect; the damage to the choroid secondary.

The exaggeration of the glial lattice could be explained as an attempt at a kind of scar production, as in atrophies of nervous tissue. Glial growth predominated, as in retinitis pigmentosa, and was associated with pigmentary changes due to the migration of hexagonal cells along the glial bands into the shrunken retina. Most of the pigment was found in the deeper layers.

Another interesting feature was the band system found on the outer retinal surface. If these structures were of vascular origin, they might have originated in the choriocapillaris and broken through the lamina of Bruch. No histologic proof of this assumption was available.

Although reminiscent of vessels in some ways, there was, on the other hand, no evidence whatever of lumen in their bandlike cross section, nor did vessels exist either at this depth or in this peripheral part of the retina.

Since a great many hexagonal cells were destroyed, this layer adhered in part to the retina and in part to the choroid, as has been described. Our final assumption was that this band system was a posterior pannus. The positive scarlet reaction manifested a fatty degeneration of the wall in the whole system.

Vascularization between Bruch's membrane and the hexagonal layer in disciform macular degeneration has been recorded by Verhoeff and Grossman (1937) and Terry (1938). According to Reichling (1937, 1938) this condition may also occur in normal senile eyes. Loewenstein's investigations have confirmed both findings.

It is clear that during the 22 years the metallic splinter was imbedded in the eye,

parts of the iron foreign body were dissolved by the intraocular fluid, and certain of the eye tissues were saturated with iron. According to d'Amico (1925) the iron and tissue proteins combine and coagulate in an irreversible chemical reaction. We can, therefore, assume that any tissue found at biopsy to be free of iron has never in fact contained it. There are many reasons for believing that the vehicle of the iron transfer is the intraocular fluid and this reasoning is in fact generally accepted by all investigators.

The localization of iron in tissues by chemical methods enables us to use it as a "tracer" substance and a guide to ocular metabolism. For instance, the freedom of Descemet's membrane and the corneal lamellas from iron salts leads us to conclude that the endothelium was alive and impermeable to the ionized iron in the aqueous.

Further, if it is conceded that the vitreous contains iron salts from secondary siderosis, their absence from the macular area and optic nerve is surprising. From our observations, we might deduce that currents in the vitreous are equatorial and not in the antero-posterior direction, the metabolism of the posterior pole being a function of the choroid, slightly assisted by the retinal vascular system.

The usual reaction of the iris to iron is of a chronic granulomatous type, but evidence that acute, purulent inflammation (polymorphs) also occurred after 20 years of the presence of the foreign body is noteworthy.

Imbibition by the zonular fibers destroys their contractility; they elongate and finally rupture. The specific gravity of the lens then causes it to sink downward. The capsulo-epithelium degenerates, and the lens capsule splits as in the exfoliation of fireworkers cataract. The lens fibers degenerate and calcify.

The macular area degenerates cystically (Haab, 1888). Fatty corpuscular cells are frequent around the eosin-red exudates in the outer molecular layers. It is our belief that these iron-free changes at the posterior pole of the eye were an indirect sequela of siderosis and were due to a chronic cyclitic process. The poor central vision sometimes found in cases of mild iridocyclitis may quite frequently be attributable to macular changes of this type.

The retinal periphery was both degenerate and saturated with iron. Pigmentary changes were marked, the migrating hexagonal cells being full of iron corpuscles. This last finding was a further confirmation of the phagocytic capacity of the mobile pigmented epithelial cells. A granular substance with minute eosinophil specks was situated between Bruch's membrane and the retina. The retinal changes corresponded to a regressive process—comparable to an abiotrophy. In both processes: (1) The location of the main changes was predominantly peripheral. (2) The nuclear layers were reduced. (3) The glial scaffolding was increased and associated with a tentaclelike migration of hexagonal cells through all the layers of the retina. (4) In both processes, where visual function was preserved, twilight vision was the first to fail.

The (fatty) degenerative, posterior pannus may be yet another expression of a dystrophic process. It is noteworthy that, up to now, changes of the last type have been found in disciform macular dystrophy and in senile retinal changes exclusively.

Summary

Examination of an eye which had retained an intraocular iron foreign body for 22 years revealed the following points of interest:

1. The corneal epithelium, corneal lamellas, Descemet's membrane, and endothelium were practically iron free, while

Bowman's membrane was packed with particulate masses of spherical bodies containing iron.

2. The iron-saturated zonular fibers had ruptured, and the lens was shrunken, deformed, and freely movable in the vitreous. The lens capsule was split, as in fireworkers cataract or in senile and glaucomatous capsular exfoliation, but was iron free. The capsular epithelium was degenerate and contained iron.

3. A cystic degeneration of the macula was iron free but showed eosin-stained exudates and fatty corpuscular cells. Macular ganglion cells were swollen and fading.

4. The retinal periphery was heavily impregnated with iron and degenerate. Glial growth predominated.

5. The choroid was far less impaired.

6. The peripheral hexagonal cells were degenerate, packed with iron, and located for the most part along broad glial bands in the retina.

7. There was a granular substance between the choroid and retina with a remarkable, probably vascular, network, a highly developed posterior degenerative pannus, the vessel walls of which were completely infiltrated with fat.

45 Park Square (1).

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ACCOMMODATIVE ASTIGMATISM*

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It has frequently been observed that a difference in the amount and/or axis of astigmatism occurs during accommodation. Those who have carefully measured the amount of astigmatism during accommodation have found an increase necessary in the amount of cylindrical correction at near. However, a review of the literature reveals but few systematic investigations of this phenomenon. During the course of routine refractions here in the Clinic, our interest in this change was aroused. Those patients who have complained of discomfort during reading or at near were investigated in order to ascertain what part this near astigmatism played in their symptoms. We have attempted, therefore, to amplify and, if possible, to offer a more systematic and complete approach to this problem. The medical background for this change has been reviewed and a formula sufficiently accurate for our work is offered. The importance of these differences to the clinical ophthalmologist will be evident when considering the adequate correction of large cylindrical errors especially in young people. The near visual distance referred to in this paper is 16 inches and the distance vision is 20 feet, and any references to the near or distance vision will be to these distances only.

In explanation of these differences, that is, changes in the amount of astigmatism during accommodation, the following factors have been offered:

1. Asymmetrical or sectional changes of the crystalline lens during accommodation.

2. A change in the optical effectivity of the spectacle lens at near due to accommodation.

3. Changes in the vertical meridian (cyclotorsion) of the eye during convergence and depression with resulting changes in the axes of astigmatism.

4. Changes in the corneal radii following convergence and depression of the eyes.

5. Changes in the shape and position of the crystalline lens itself during accommodation.

The idea that an asymmetrical contraction of the ciliary muscle could cause astigmatism was suggested by Dobrowolsky[1] in 1868. This might easily follow since lenticular astigmatism could readily be the cause of the differences found between subjective astigmatism and keratometric readings. In order to ascertain the existence of meridional lenticular accommodation, Hess[2] performed the following experiment. Two fine, white, cotton threads were used as test objects, these being mounted on separate supports and so arranged that each could be moved to and from the eye along the visual axis. The threads were placed at right angles to each other, these axes corresponding to the principal axes of the astigmatism. Each was now set at that distance at which the thread would be sharply defined in accordance with the previously measured astigmatism. If one thread were moved nearer the eye, an attempt to accommodate in this meridian would occur. Whether the other line remained clear or appeared blurred would be evidence for or against the existence of lenticular accommodation. Hess observed 23 cases, and in his series the astigmatic accommodation found was only of the order of

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0.1 D. Some of these changes might have been due to a rapid fluctuation in the total accommodation corresponding to the interval of Sturm.

This subject has been thoroughly reviewed by Erggelet,[3] who coined the term near-astigmatism (nahastigmatismus). Erggelet was not of the opinion that asymmetrical lenticular changes were the cause of the increase in astigmatism during accommodation.

A few authors have written of changes observed in testing astigmatic subjects at 20 feet and 16 inches, the conclusion being drawn that these changes were due to meridional lenticular astigmatism. Lancaster[4] reported a case, in 1916, of astigmatic accommodation in a patient following an attack of food poisoning in which the central nervous system become involved. The astigmatism varied in one eye from +0.75D. cyl.ax. 20° to +2.75D. cyl. ax. 80° through a six-months period. Under cycloplegic +0.25D. cyl.ax. 90° was measured. Lancaster concluded: ". . . It was natural to surmise that the change was due to a change in the action of the ciliary muscle. As the nuclear cells recovered from the damage by the toxin, some cells would recover better than others, and so the part of the ciliary muscle under their control recover tone better than the other parts; from this would result an unequal tension on the suspensory ligament and a consequent unequal curvature of the anterior surface of the lens."

Sheard[5] also found astigmatic changes of from ½ to ¾ D. at short-fixation distance, and he concluded that the possibility of accommodative astigmatism does exist.

In a recent paper by Hughes,[6] eight cases of change in axis of astigmatism with accommodation were reported. However, only the fifth case presented can actually be said to give evidence of lenticular astigmatic accommodation. In this case, a rupture of some of the zonular fibers was observable. Four of the remaining seven cases were presbyopic which eliminates the accommodation factor, and in three cases, corneal or lenticular pathologic conditions were noted. Sugar[7] reported a study of 70 cases and observed changes in axis of the astigmatism at near, but apparently he made no attempt to determine the changes in *amount* that should occur in near vision. In both Hughes' and Sugar's papers, a change in the axis of astigmatism at near was noted but the increase in astigmatism at near when accommodation occurs was not considered.

Differences in the axis of astigmatism at near might be explained by a change in the cyclotorsional position of the eyes as they accommodate and turn downward. Because of the tendency for a cyclotorsional movement of the eyes to be associated with convergence, a regular shift of axis might be expected. However, generally this change is small and is ordinarily below the precision with which the axes can be determined.[8] Large cyclophorias may occur with convergence in some individuals which would undoubtedly affect the axis of the astigmatic correction.

Two points should be remembered when dealing with astigmatism at the near point. First, there is a demonstrable change in the optical effectivity of the cylinder at near for an accommodating eye. Second, the astigmatism at near will be different with different methods of testing; that is, the use of different types of targets, such as letters, charts, and so forth.

Effectivity of a cylindrical lens for near vision

When the eye changes its fixation from a distant object to one at near, and accommodation occurs at the same time, it can be shown that the cylindrical effectivity of the lens correcting the astigmatism also changes. Percival[9] notes: "After

correcting a high degree of astigmatism and obtaining a visual acuteness of 6/6 . . . I have often been disappointed with the result I obtained when testing the patient's near vision. . . . I determined to see if the effective value of the cylinder was altered when used for near work. To my surprise and delight I found that this was so, and my difficulty was thereby explained." The astigmatism of the accommodated eye, corrected for distance, becomes slightly undercorrected, the effectivity of the correction less. This effect was called "near astigmatism" (nahastigmatismus) by Erggelet to designate the apparent increase in the astigmatism that occurs when the eye wearing a correcting astigmatic spectacle accommodates for near visual distances. Therefore, a subject with an astigmatism of high degree can be fully corrected for 20 feet, but when accommodating at 16 inches, the effect of the cylindrical lens is decreased, and conversely the subject's astigmatism will appear increased.

A sufficiently accurate formula from which the required near cylinder can be computed, when the strength of the distance cylinder is known, is:

$$C_n = C_d \left[1 + 2h\left(\frac{1}{p} - A\right)\right]^*$$

where C_n and C_d are the astigmatic correction for near and distant vision; p is the near distance (in meters) from the lens, h is the distance of the lens from the eye and A is the spherical addition ("add") to the lens for near vision. In presbyopia an adequate near "add" must be included in the correcting lens. In this case, then, $A = \frac{1}{p}$ and thus the effectivity of the near cylinder is equal to the distance cylinder. When the eye fully accommodates in looking from 20 feet to 16 inches, no "add" is needed and consequently $A = O$, and C_n will be different from C_d. For a 1.00 D. correcting lens at 15 mm. from the eye and using a reading distance of say 30 cm., C_n will equal 1.10 C_d or the increase in the near cylinder will be in the order of 10 percent as compared to the distance cylinder.

Other sources of difference not included in the above formula may occur because of the following: In calculating the near astigmatism there will be a difference depending upon whether the more or less hyperopic meridian is taken as the reference for the accommodative change. The sphere used in sphero-cylinder combination may also, especially if high, affect the near astigmatism correction. The physical dimensions of the correcting lens used, especially thickness, will have a small influence. All these factors, however, introduce differences of the second order only, and can be neglected. We can thus see that in dealing with cylinders of large order, as Percival has noted, maximum visual acuity may not be obtained unless this change in near astigmatism is accounted for.

The present investigation

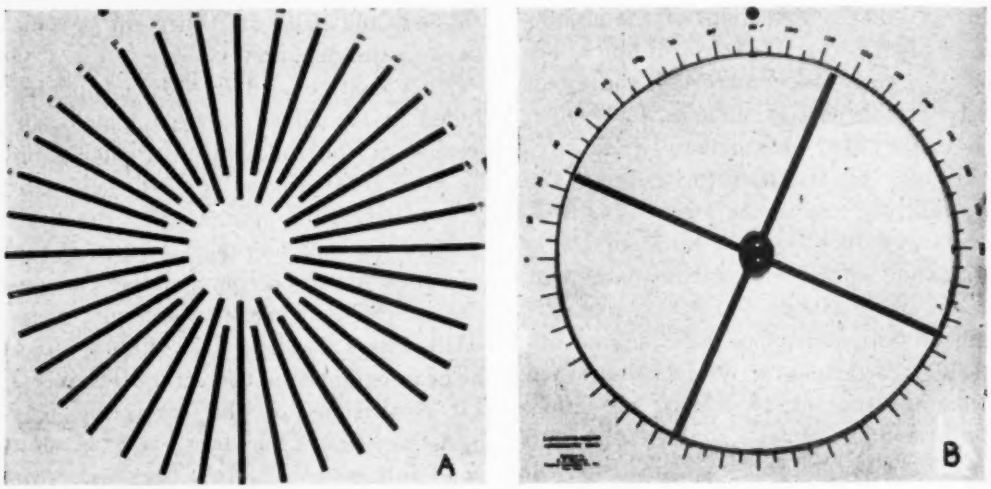
The essential contribution in the study reported here lies in the fact that three different methods of measuring the astigmatic error for both distant and near vision were used. Not only were changes in the amount of astigmatism at near measured, but also changes in the direction of the change of the axis at near were noted. The first method was the Lancaster-Regan astigmatic chart[10] and dial. The second was the Jackson cross-cylinder test in which an attempt was made to maintain the strength of the

*We are indebted to Kenneth N. Ogle, Professor of Research in Physiological Optics, Dartmouth Eye Institute, for the derivation of this formula.

cross cylinder in keeping with the strength of the cylinder under estimation. The third was the method of stigmatoscopy which in our opinion offers the most accurate means of determining the amount and the axis of astigmatism at our disposal.

It was considered important that the technique employed in the near-vision tests should be as similar to those used for distant vision as possible. The cross-cylinder test on letters and the stigmatoscopy test are easily adapted for near-point estimation and the technique in each instance is substantially the same as that used for distance testing. However, in the case of the astigmatic chart and dial, there were none available for near-point use, and this resulted in our devising a near-point astigmatic chart and dial.

With the Lancaster-Regan astigmatic chart and dial, the system of adequate fogging together with the use of negative cylinders was followed. It was our aim to keep the posterior focal line of the interval of Sturm preretinal at all times. The effective fogging sphere was found by standard retinoscopic technique. For the near visual distance of 16 inches, reduced photographic reproductions of the Lancaster-Regan chart and dial as designed by Bannon[11] were employed. The chart and the dial were attached to the opposite sides of a double sheet of heavy white cardboard. The dial was attached in such a way that it could be rotated by means of a handle through 90°, in the same manner as could the large Lancaster-Regan dial (figs. 1A and 1B). This adaptation of the chart and the dial for use at near vision was found simple and yet effective in use. The dynamic cross-cylinder test[12] gives an indication of the amount of plus sphere necessary to place the conjugate foci in front of the retina. On the average, it was found necessary to add +0.50D. sph. to the distance correction in nonpresbyopic cases so that the patient would be properly



Figs. 1A and 1B (O'Brien and Bannon). For the near visual distance of 16 inches, reproductions of the Lancaster-Regan chart and dial were employed. These were attached to the opposite sides of a double sheet of heavy white cardboard. 1A, Near vision astigmatic chart. 1B, Near vision adjustable astigmatic dial. The dial was attached to the sheet of cardboard in such a way that it could be rotated by means of a handle through 90°.

fogged for the near-point astigmatic test. The same routine of fogging together with the use of negative cylinders was followed. Sufficient positive trial-case spheres were again used to keep the astigmatic foci of Sturm's interval anterior to the retina. The routine differed actually in no manner from that employed at 20 feet.

In the cross cylinder test, we followed the technique as outlined by Jackson.[13] This method was used for both the 16-inches and the 20-feet tests. In dealing with high astigmatic errors, the stronger cross cylinders were used and vice versa when the errors were small. By using the cross cylinder of powers comparable to the astigmatism, higher precision will result.

The method of stigmatoscopy is based upon the ability of the eye to discriminate, with precision, the change in blurredness of the retinal image of a point source of light. The instrument[14] is essentially a haploscope in which the mirrors are half-silvered. This permits binocular fixation and fusion of a suitable target before the eyes, and at the same time permits point light sources supported on the arms, to be seen by reflection, and appear superimposed upon the target. Each eye sees a different point light source. These sources are mounted on riders which can be moved along the haploscope arms, and are maintained along the fixation lines of the two eyes. As the distance of one of the point light sources is changed, its blurredness will appear to change. The patient is directed to turn a suitable knob (which in turn moves the source along the arm) until the light appears smallest and neatest. At this position the source is conjugate to the retina, and the distance from the eye in diopters is a measure of the refractive condition of the eye. In an astigmatic eye the light source can be focused for one and then the other of the Sturm lines. The difference in distances (in diopters) from the eye is the measure of the astigmatism. Visual acuity tests are used in conjunction with the test to determine the final spherical correction. Repeated settings permit unusual precision.

We feel that by the above three methods we have given a more careful study to the problem than has heretofore been available. The comparison of the three methods gives a good cross-sectional view of the refractive problem, not only with respect to the astigmatism but also the spherical error.

Results

The data will be presented with respect to differences in the amount of astigmatism at near and differences in axis at near. The data are from 25 cases, spread evenly through cylinder ranges of 0.50D. to 5.00D. The stigmatoscopy data have been rounded off to the nearest 0.25D. In obtaining the change in the amount of astigmatism at near, 0.25D. was used as the standard, and no attempt was made to estimate changes of smaller degree. With respect to the change in axis, changes of 2 degrees represented the general amount of shift that could be accurately estimated.

A. Differences in the amount of astigmatism

An inspection of the table shows that there is on the average a small increase in the astigmatism at near, an increase that is consistent for all three tests. Only in one case was there a decrease at near. The average quantitative increase is shown in the scatter diagram in Figure 2, where the data are for the astigmatic chart and dial method. Clearly the points representing the measurements cluster about a line that has a slope about 10 percent higher than if no change in astigmatism

had been found. Thus on the average the astigmatism at near is measured 9 percent to 10 percent greater than is measured at distant vision. A comparison of the three tests as tabulated with respect to the increase in cylindrical power necessary to correct the astigmatic error at near is shown in Table 1.

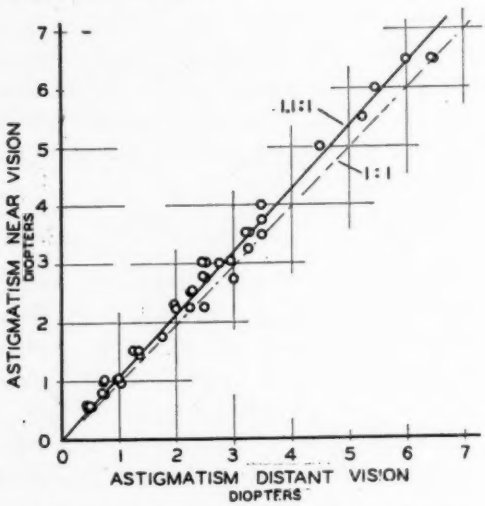


Fig. 2 (O'Brien and Bannon). Scatter diagram showing change in astigmatism at near vision.

An increase in the astigmatism at near of about 9 percent should be expected in those cases where there is adequate accommodation (table 2).

B. Differences in axes of astigmatism

In studying the change in axis of the astigmatism from distance to near vision, one must keep in mind that the precision of the measurements is much less for weak cylinders than for strong. In Table 3 are shown tabulated the average number of degrees change in astigmatism for the different strengths of the cylinder correction. Greater differences are found for the weaker cylinders, but of a magnitude which is believed greater than the variations that would occur in the precision of measurement.

In Table 4 are the tabulated results on the direction of these changes in axis. The significance of the difference in direction of these changes may be better appreciated if one considers that the stigmatoscopy

TABLE 1

Increase of cylinder measured at near
(Number of Eyes = 50)

Diopters of Astigmatism	Astigmatic Chart and Dial	Cross Cylinder Test	Stigmatoscopy
0 to 1.00 D.	12.0%	11.5%	11.1%
1.00 to 2.00 D.	4.9%	3.1%	5.11%
2.00 to 3.00 D.	9.0%	8.8%	9.03%
3.00 to 4.00 D.	3.4%	6.0%	9.1%
4.00 — up D.	9.1%	9.0%	9.2%

TABLE 2

Calculated increase in cylinder at near reading distance

Convex		Concave	
C_d Distance Cylinder	C_n Equivalent Near Cylinder	C_d Distance Cylinder	C_n Equivalent Near Cylinder
+ 1.00	+ 1.092*	− 1.00	− 1.093*
+ 2.00	+ 2.183	− 2.00	− 2.188
+ 3.00	+ 3.272	− 3.00	− 3.284
+ 4.00	+ 4.360	− 4.00	− 4.382
+ 5.00	+ 4.447	− 5.00	− 5.481
+ 6.00	+ 6.532	− 6.00	− 6.581
+ 8.00	+ 8.699	− 8.00	− 8.785
+10.00	+10.860	−10.00	−10.995

* The third decimal point may be omitted from these two columns.

TABLE 3

Changes found in cylinder axes between distant and near
(Number of Eyes = 50)

Diopters of Astigmatism	Astigmatic Chart and Dial	Cross Cylinder	Stigmatoscopy
0 to 1.00 D.	3.5°	7.5°	8.1°
1.00 to 2.00 D.	6.1°	7.5°	7.0°
2.00 to 3.00 D.	3.9°	4.0°	4.2°
3.00 to 4.00 D.	1.8°	3.8°	4.0°
4.00 — up D.	2.3°	1.0°	2.4°

test is binocular; whereas, the chart and dial tests were monocular. One can see from Table 4 that there is a tendency for the superior pole of the vertical axis of the eye to rotate outward when tested binocularly as with the stigmatoscopy. Also it can be noted that, in testing monocularly, this tendency toward outward rotation of the upper pole of the eye is less marked. Whereas, the number of eyes examined in this series is not considered significant enough to warrant a definite conclusion, it can be seen that relation of depression and convergence and cyclotorsion of the eyes when accommodating for near reading distances is most important.

TABLE 4

DIRECTION OF AXIS CHANGES AT NEAR READING DISTANCE (16 INCHES)

	Astig. Chart (No. of Cases)	Cross Cyl. (No. of Cases)	Stigmatoscopy (No. of Cases)
Inward rotation of upper pole of vertical axis	9	9	14
Outward rotation of vertical axis	14	13	7
No change in axis	2	3	4

Many more eyes should be used in an experiment of this type, for with the number of variables present, a greater number of cases in each category are really necessary before a fully satisfactory statistical study can be made. However, these data are significant and warrant their being summarized at this time.

SUMMARY

The astigmatism was measured on 50 eyes for distance and near vision by three techniques: (1) the Lancaster-Regan chart and dial, (2) the cross-cylinder, and (3) the stigmatoscopy methods. A consistent increase in astigmatism of from 8 percent to 10 percent was measured for near vision by all three methods. This increase was in the direction and approximate amount to be expected due to the loss in effectivity of cylinders prescribed for distance vision when used for near vision, before a fully accommodating eye. For astigmatic errors of the lower powers this factor is negligible, but for higher powers it should not be neglected.

Change in axes of the astigmatism was also found but there was no trend in this change consistent with changes in cyclotorsional positions of the eyes with convergence or lowering of the eyes.

CONCLUSION

If we have stimulated the interest of the practitioner in looking for these changes, the purpose of this paper has been achieved. Suffice it to say that the facts exist, but by and large they have been overlooked or ignored by most practitioners. Their importance is evident when one considers the problem of large astigmatic errors in young people. We have attempted to demonstrate that the distance refraction cannot in itself be considered accurate at near when astigmatism is involved to any significant degree. The difference between the rote method of refraction and that of the skillful refractionist's will be reflected in the results obtained. Changes in amount and/or axis of astigmatism at the near point should be looked for, and with a full knowledge of the results to be sought and the methods applied, one more weapon in the armamentarium of the competent refractionist is available.

The authors wish to acknowledge, with gratitude, the advice and inspiration received from Dr. Walter B. Lancaster.

4 Webster Avenue.

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INVOLVEMENT OF THE ORBIT IN CHRONIC INFLAMMATION OF THE FRONTAL SINUS*

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It is a well-established fact that chronic diseases of the frontal (and ethmoid) sinus may involve the orbit. Among these diseases, the mucoceles and pyoceles are most frequent, causing pseudotumors in the inner and superior angle of the orbit. In fact, the tentative diagnosis of mucocele is almost immediately made when there is a tumor covered by normal skin in the inner and superior angle of the orbit, above the internal palpebral ligament. It is of minor importance whether or not there is a displacement of the eyeball and whether palpation of the tumor yields fluctuation.

The purpose of this paper is to demonstrate: (1) that tumors in the inner and superior angle of the orbit are not always caused by mucoceles of the frontal and ethmoid sinuses; and (2) that extension of chronic inflammation of the frontal sinus does not always occur into the inner and superior angle of the orbit.

Tumor formation in the inner and superior angle of the orbit may occasionally indicate a pathologic condition in the orbit without involvement of the paranasal sinuses. In this respect, the so-called pseudotumors of Birch-Hirshfeld[1-9] are of great interest. The term denotes a finding which usually shows proptosis, limitation of eye movements, increase in bulk of the orbital tissue, and possible swelling of the lids. The onset is slow, and the usual signs of inflammation are absent. The etiology of pseudotumors of the orbit is not known, although in several cases tuberculosis, syphilis, or focal infections were considered responsible. Pseudotumors are not frequent; nevertheless, the clinical evaluation of these granulomas is important from a practical standpoint, since there are instances reported in which an exenteration of the orbit was performed under the pretext of removing a malignant tumor.

Although in the advanced stage pseudotumors may give the impression of malignant orbital tumors, in the early stage they might be considered as being rhinogenic in origin. As pointed out by Meller[5,6] pseudotumors are frequently noticed first at the superior, or superior and mesial, margin of the orbital opening, at a site which is likewise occupied by mucoceles or abscesses originating in the paranasal sinuses.

Case reports

The following case is of interest because it did not present the eye symptoms which are supposed to be typical in instances of pseudotumors.

Case 1

History. J. F., a man aged 32 years, noticed about eight years ago a swelling the size of a pea in the inner angle of the left eye. This grew slowly to the size of a cherry stone. He was never injured at that site. Three years ago, a surgeon incised the swelling and removed part of it. Following the operation, the tumor became even larger than before. Eight months later, the tumor was again removed by another surgeon. After this operation, the eye was closed and swollen for five weeks. Four months after the

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second operation, the tumor again recurred. The patient did not complain of headache. Occasionally, there was a great amount of mucous discharge from the nose, and this was followed by a decrease of the swelling over the eye.

Examination: On examination, June 15, 1945, there was a swelling in the inner

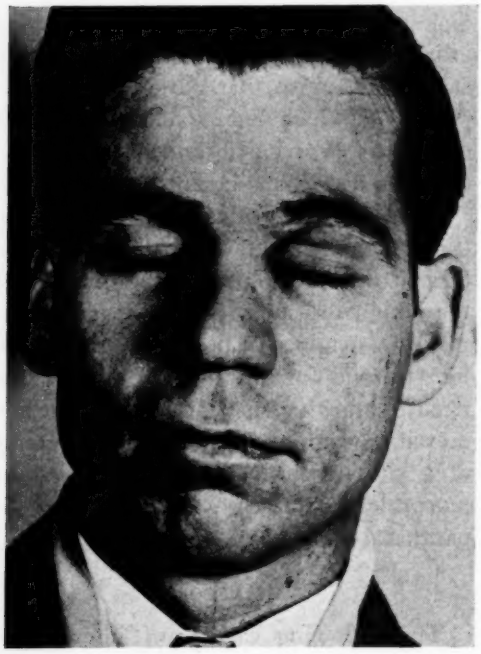

Fig. 1 (Benford and Brunner). Note the scar in the inner angle of the left eye after removal of a pseudotumor.

angle of the left eye, located above the internal palpebral ligament and covered by normal skin. The swollen area extended over the bridge of the nose toward the glabella. In the skin, small surgical scars were noticed.

The tumor had a medium-soft consistency. The left palpebral fissure was narrower than the right. Eye movements were normal, and there was no exophthalmos. The right nostril was normal. On the left side, the agger nasi and the uncinate process were bulging. There was no secretion in the nose. X-ray films showed a slight haziness of the right ethmoid, right-frontal and right-maxillary sinuses. The left frontal sinus was not developed. The left ethmoid was clear; the left maxillary sinus was slightly hazy. There were no signs of tuberculosis, lues, or leukemia. The tentative diagnosis of a mucocele of the left ethmoid was made. On July 5, 1945, an arcuate incision was made in the inner angle of the left eye under local anesthesia. In the supraorbital arch, a diffuse, soft swelling was found, the puncture of which did not reveal fluid. The periorbit was elevated down to the posterior lacrimal crest, and a communication to the nose was created through the frontal process of the maxilla.

A tumor the size of a date was found. This apparently had the insertion on the posterior lacrimal crista. The tumor penetrated the orbital septum and extended toward the glabella and to the center of the supraorbital arch. In the orbit, the tumor was located between the periorbit and the bone; at the forehead, between the skin and the thickened periosteum of the bone. Numerous branches of the anteriorethmoidal and supraorbital nerve passed through the tumor. These branches were severed, and the tumor was removed by blunt dissection. The hemorrhage was considerable. After removal of the tumor, a shallow groove was found in the frontal squama together with a thickening of the lacrimal bone. Uneventful recovery ensued. There was no recurrence during an observation period of nine months (fig. 1).

Microscopic Examination. The tumor consisted of connective tissue, striated muscle fibers, small blood vessels, and nerves. The connective tissue was firm. It did not show degeneration nor definite signs of inflammation. The nerves were normal, as were the walls of the small arteries. The small veins showed a peri-

vascular infiltration consisting of loosely arranged lymphocytes and plasma cells. Occasionally the cells were adjacent to only one wall of the vein, while the opposite wall did not show infiltration.

The muscular tissue occupied the greater part of the specimen. The muscle fibers were to a great extent entirely normal. There were, however, several localized spots presenting different changes. The slightest change consisted of an edema of the muscle. At these sites, the muscle fibers might show a normal structure, or they might have lost their striation and be broken up into several pieces. Between the muscle fibers, there were usually a few scattered lymphocytes. At other sites, there was an accumulation of lymphocytes and plasma cells between the muscle fibers, usually surrounding a capillary (fig. 2). These accumulations of lymphocytes might reach such a size that they could be seen macroscopically. In such instances, the lymphocytes might form follicles and invade the muscle fibers, the remnants of which could be seen between the lymphocytes (fig. 3). There were no giant cells.

Comment. In this case, the erroneous diagnosis of a mucocele was based upon a misleading history given by the patient. Since there was no exophthalmos or limitation of eye movement, it was scarcely possible to make the correct diagnosis. The operation was hemorrhagic; nevertheless, the tumor was removed since it did not extend too far into the orbit and was fairly well encapsulated. Whether or not the cure is definite, cannot be stated because in these instances, recurrences in the same or in the other eye may occur after a period of several months. In the event of a recurrence, the appropriate treatment would be administration of iodine and arsensics, and eventual X-ray therapy, rather than surgical intervention.

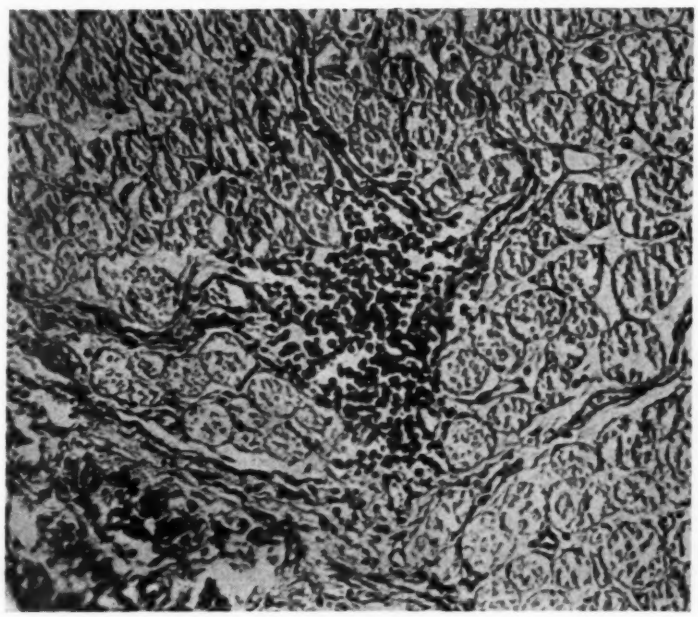

Fig. 2 (Benford and Brunner). Note the accumulation of lymphocytes between the muscle bundles and along the capillaries.

According to Birch-Hirschfeld,[8] the principal microscopic features of these

tumors are: (1) Accumulation of lymphatic tissue. (2) Proliferation of the intima and hyaline degeneration of the walls of the blood vessels. In the presented case, the changes in the blood vessels were absent, but the accumulation of lymphatic tissue was marked and the formation of follicles was noted.

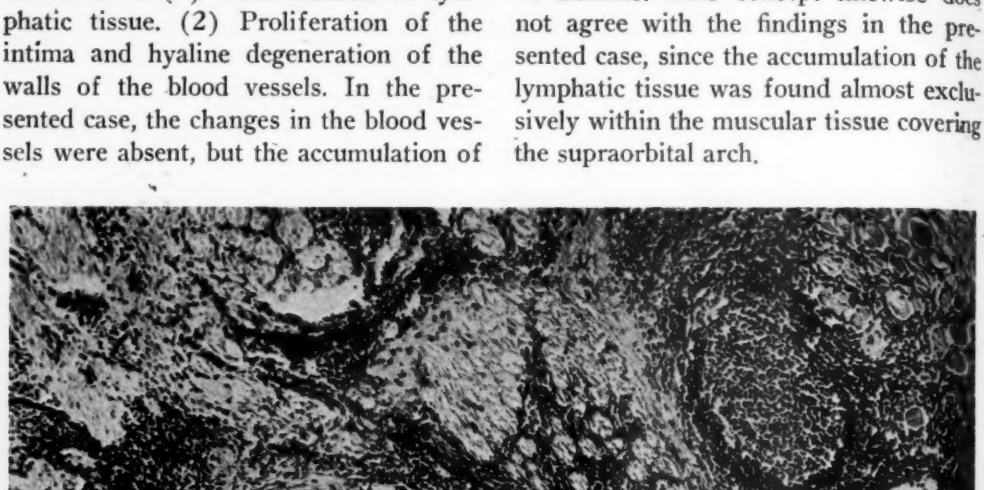

Fig. 3 (Benford and Brunner). Microscopic section showing two lymph follicles and lymphatic infiltration between the muscle fibers.

The pathogenesis of the lymphatic tissue is not clear. Several ophthalmologists believe that it derives from the small amount of lymphatic tissue which is found in the fornix conjunctivae and near the lacrimal gland under normal circumstances. This concept does not agree with the finding in the presented case since the tumor had no relation to the fornix or the lacrimal gland. Birch-Hirschfeld claims that the lymphatic tissue may originate from the lymphatic crevices which he has found in the orbits of animals. This concept likewise does not agree with the findings in the presented case, since the accumulation of the lymphatic tissue was found almost exclusively within the muscular tissue covering the supraorbital arch.

In striated muscles, lymph vessels are found only on the outside, but they seldom extend into the muscle along the broad connective tissue septa, and are never found between the muscle fibers (Schaffer). For this reason, the lymphatic tissue did not originate from the lymph vessels of the muscle. The microscopic examination revealed that the lymphatic tissue apparently originated from the capillaries between the muscle fibers. Neither microscopic examination nor clinical observation gave any information concerning the etiology of the pseudotumor in the presented case.

Although the tumor of the orbit in Case 1 was erroneously considered to be of paranasal origin, inflammatory tumors of the orbit of definite paranasal origin were found in Cases 2 and 3. This finding is important because inflammatory tumors of the orbit arising from the paranasal sinuses are practically unknown, if one excepts the rare occurrence of tuberculosis of the ethmoid which extends into the orbit. This contrasts sharply to the incidence of acute inflammation of the orbit originating in the paranasal sinuses which accounts for about 60 percent of all cases.

CASE 2

Z. B., a white woman aged 21 years, was hit in the region of the mesial canthus of the left eye by a peach pit shot from a sling shot. Shortly after this accident occurred, 12 years ago, she injured her nose in the region of the left eye by bumping herself on a desk. Soon after these two injuries, she noticed a swelling in the region of the inner canthus of the left eye. This was accompanied by considerable pain in that area and in the eye, as well. Intermittently, the pain was so severe that her eyeball felt like it was going to burst. The pain continued, and the swelling advanced, involving the mesial angle of the eye (fig. 4). At times the eye swelled shut and became black. These attacks came on when she had a head cold or became nervous. Cold wind or night air would start the pain. Soon after, the swelling would increase and become discolored. As soon as the head cold subsided, the black color would rapidly disappear.

About five years before this examination, there was a yellowish discharge from the nose. This discharge continued and became worse when the patient had a cold.

Examination. At admission, June 8, 1944, a swelling was found at the inner angle of the left eye above the internal palpebral ligament and extending toward the bridge of the nose and the glabella (fig. 4). The swelling was covered by normal skin and had a doughy consistency. There was no defect of the

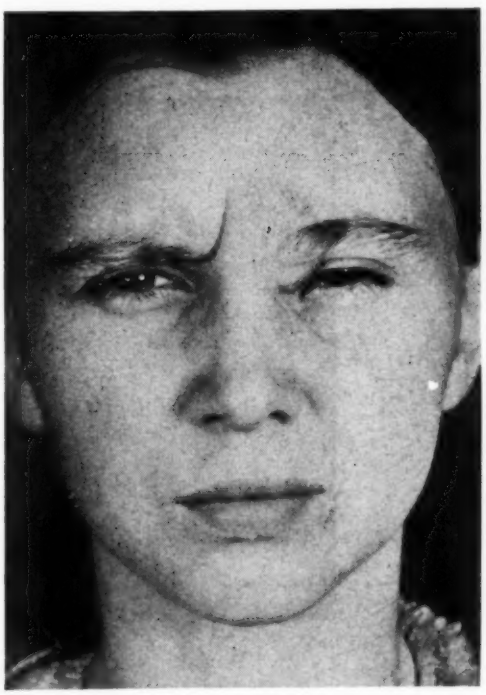

Fig. 4 (Benford and Brunner). Note the tumor in the inner angle of the left eye.

underlying bone. The left eye seemed to be slightly displaced downward. The left middle turbinate was slightly hyperplastic, but there was no other pathologic condition in the nose.

X-ray studies showed the following: Absence of the left frontal sinus; absence of a part of the mesial superior portion of the left orbit with some upward displacement of the margins of the defect and sclerosis of that area; clouding over the left ethmoidal, maxillary, and sphenoidal sinuses (fig. 5). Wassermann and Kahn tests were negative. It was not

possible to make a definite diagnosis. The tentative diagnosis pointed to either a chronic osteomyelitis of the left supraorbital ridge or to a mucocele of the ethmoid.

Under general anesthesia, an arcuate incision was made in the inner angle of the left eye, and immediately a large mass of granulation tissue was exposed. The hemorrhage was formidable, and it was extremely difficult to separate the thickened and granulating periosteum from the floor of the frontal sinus. The granulating periostitis extended deeply into the orbit along the superior and the mesial walls. The frontal bone was uneven, sclerotic, and anemic. There was no pus.

Since the condition of the patient did not permit the removal of the floor of the frontal sinus, the frontal process of the maxilla was removed, and the anterior ethmoid was curetted in order to perform a wide drainage of the periostitis into the nose. There was no involvement of the posterior ethmoid. The skin incision was partially closed.

Two days after the operation, there was a marked swelling of the skin over both upper lids and forehead, but there was no redness of skin. There was no pain and no fever. Nevertheless, the wound was partially opened, and 10,000 units of penicillin in 5-percent glucose were administered intravenously over a 10-hour period. The patient made an uneventful recovery, and 11 months later she felt fine, had good appetite, and was gaining in weight. There was almost no headache, but the tumor in the inner angle of the left eye had not changed.

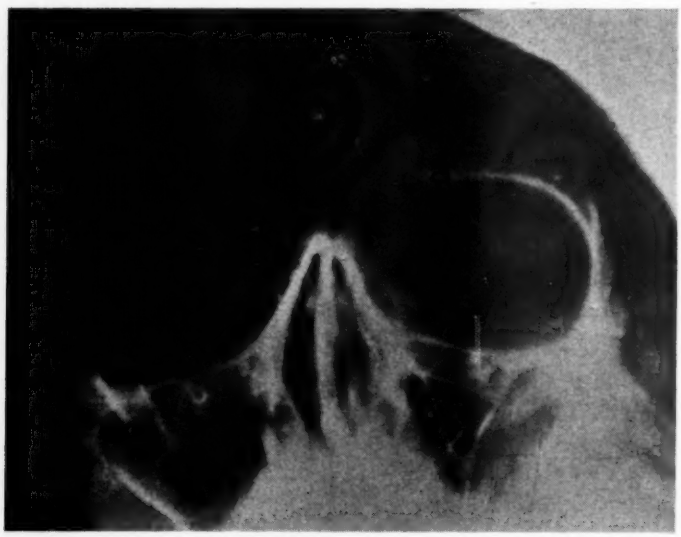

Fig. 5 (Benford and Brunner). a. Chronic osteomyelitis of the left supraorbital ridge. b. Small frontal sinus on the left side.

Comment. This was a typical case of primary, chronic osteomyelitis of the frontal bone following injuries to the bone. Usually an infection of this type causes a thickening and sclerosis of bone, eventual necrosis, formation of sequestra, and an infection of the frontal sinus. In the presented case, the disease ran over a period of 12 years, and the outstanding symptoms were severe headache, toxemia, and a tumor formation in the inner angle of the left eye.

The tumor consisted of granulations which were covered by a normal skin. The granulations were caused by a granulating periostitis (fig. 6) which extended deeply into the orbit. This is an occasional finding in syphilitic periostitis of the frontal bone. However in the presented case, the Wassermann and Kahn tests were negative. This case proves, therefore, that common chronic osteomyelitis of the frontal sinus may occasionally cause inflammatory tumors of the orbit which consist of granulation tissue and are due to a granulating periostitis of the anterior and inferior sinus wall.

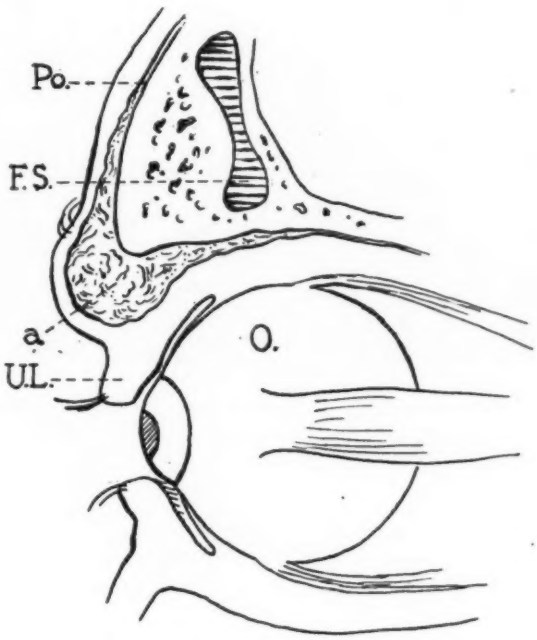

Fig. 6 (Benford and Brunner). Po, Periosteum; F.S., Frontal sinus; a. Tumor consisting of granulation tissue, due to a granulating periostitis; U.L., Upper lid; O. Eyeball.

The excruciating pain which the patient was suffering, required surgery. The proper operation would have been the removal of the entire osteomyelitic area. This operation was not performed for three reasons: (1) The patient had not given consent to that type of operation, since a definite diagnosis had not been made prior to surgery. (2) The operation would have resulted in a bad disfiguration of the face. (3) The simple exposure of the frontal sinus had caused such a formidable hemorrhage that a radical operation upon the thickened and sclerotic bone would have been fraught with hazards.

For these reasons, it was decided to create a decompression of the orbit into the nose. The frontal process of the maxilla and the anterior ethmoid were removed so that the granulations could bulge into the nose. The result of this decompression was satisfactory. The patient was almost completely relieved of headache, gained weight, and was in good spirits. Nevertheless, it is questionable

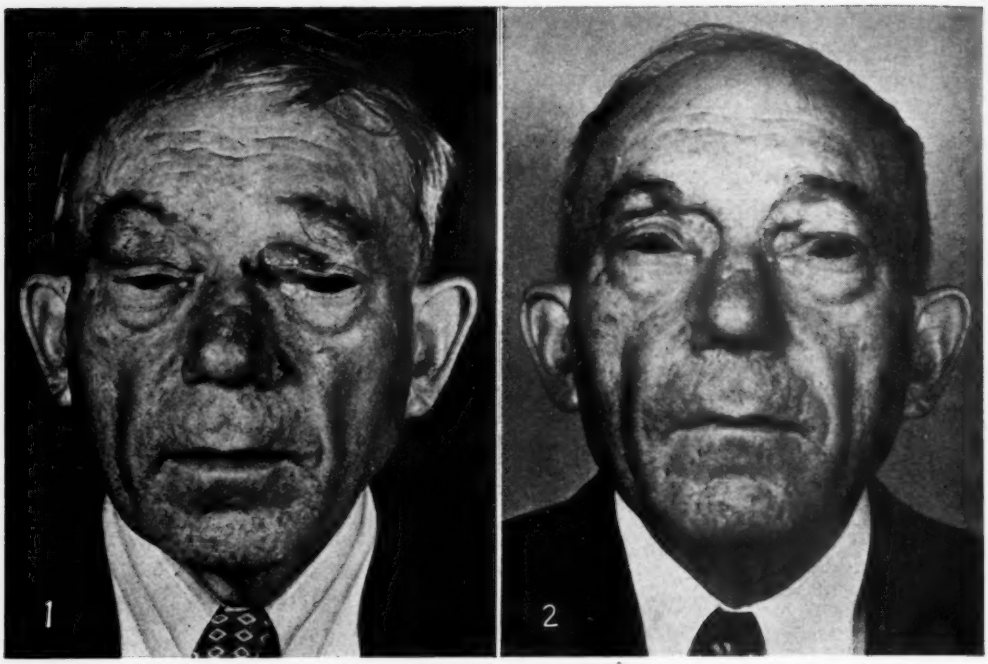

Fig. 7 (Benford and Brunner). 1. This picture indicates the findings prior to operation. Note the tumors in the outer angle of the right eye and in the inner angle of the left eye. 2. This shows the patient after the operation.

whether or not this result will be permanent.*

CASE 3

J. M., a man, aged 61 years, fell on his head from a horse 40 years before. Three years ago he noticed a bilateral growth above both eyes. An unsuccessful operation was performed. Polypi were removed from the nose on April 22, 1944. Bone was found within the polypi. This operation likewise had no influence upon the tumors above the eyes. There was an occasional headache.

Examination. On examination, October 19, 1945, a tumor, 1.5 x 2 cm. was found, covered by normal skin. It was located in the lateral part of the right upper lid (fig. 7). The tumor pushed the eye downward and narrowed the palpebral fissure; it also raised the lateral part of the eyebrow.

On palpation, the tumor presented a fluctuating encapsulated mass which apparently protruded through a perforation in the floor of the right frontal sinus. The margins of the opening in the floor of the sinus were markedly thickened.

The right eye was normal except for a slight restriction of the movement upward. In the mesial portion of the left upper lid, there was an opening in the skin about the size of a penny. The margins of the opening were sharp, not granulating, and a tumor the size of a normal ovary emerged through the opening.

The tumor consisted of polypoid tissue, and a small amount of mucopus escaped between the polypi. When pressure was exerted upon the tumor on the right side, a great amount of pus escaped between the polypi on the left side. The

* The result was not permanent, since headache returned several months later.

left eye was displaced inferolaterally. The skin over the left tear sac was inflamed, but there was no dacryocystitis. The supraorbital ridge on the left side was uneven but intact. Conjunctiva and eye movements were normal on the left side. The right nostril was filled with polypi. The left nostril was large; the inferior turbinate atrophic. There were two large polypi, both apparently originating in the ethmoid. The epipharynx was filled with mucopus, and the breath had a foul odor.

X-ray films showed an increased density over the left maxillary antrum, ethmoids, sphenoids, and frontal sinuses. On October 20th, the tumor in the right upper lid was exposed, the capsule incised, and 20 cc. of pus were aspirated. The pus contained hemolytic staphylococcus aureus.

An arched incision was then made below the right eyebrow. The floor of the frontal sinus was exposed and found to be normal except in the most lateral part where a narrow fistula was noticed. A sac filled with pus emerged through the fistula. The walls of the sac were firmly adherent to the periorbit and were a continuation of the mucosa of the frontal sinus. In other words, the tumor of the right upper lid was caused by a herniation of the mucosa of the frontal sinus which had escaped through a narrow fistula in the floor of the sinus (fig. 8).

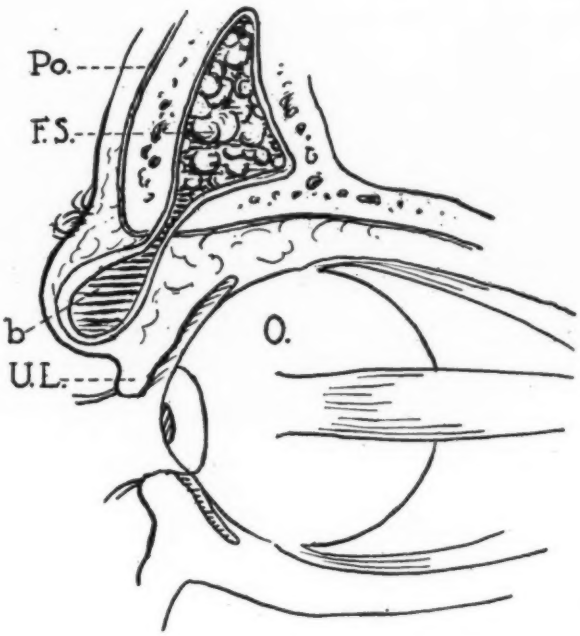

Fig. 8 (Benford and Brunner). Po, Periosteum; F.S., Frontal sinus; b, Herniation of the frontal sinus mucosa, filled with pus; U.L., Upper lid; O, Eyeball.

Next, the floor of the sinus was removed. The entire sinus was filled with polypi which extended into the sac that emerged through the fistula. A part of the frontal process of the maxilla, including a part of the apertura piriformis, was found to be transformed into a sequestrum. The sequestrum was removed. This created a large opening into the nose. The anterior ethmoid was curetted.

The next step was to make an arched incision below the left upper eyebrow. There was a large perforation in the floor of the frontal sinus and in the lateral wall of the anterior ethmoid. Through this large perforation protruded polypi which were in direct connection with the polypi forming the tumor in the upper eyelid.

The left frontal sinus, which had a large temporal recess, was entirely filled with polypi that extended through a perforation in the interfrontal septum into the right frontal sinus. All polypi were removed. The posterior walls of both frontal sinuses were normal.

On the evening following the operation, the patient's temperature rose to 104°F. (rectally) due to a bronchitis. Penicillin was given, and the temperature fell gradually by lysis until it became normal on October 28th.

Since the right nostril was filled with polypi and bony sequestra were palpated within the polypi, an external ethmoid oeration was performed under local anesthesia on November 24th. A thick connective-tissue membrane that had grown together with the periorbit had closed the opening into the nose. After removal of the membrane, the right ethmoid was found to be filled with polypi and bony sequestra which were remnants of the bony septa between the ethmoid cells. The polypi were thoroughly removed, and the fistula in the left upper eyelid was closed. Uneventful recovery ensued.

Microscopic Examination. The sac on the right side (fig. 9) consisted of connective tissue which was covered by an intact, somewhat thickened epithelium associated with papillary areas which were lined by respiratory epithelium. The latter zones were vascular and markedly infiltrated by round cells, while the former zones presented a moderate infiltration. The mass from the upper lid consisted of markedly edematous tissue associated with round-cell infiltration and with widely dilated blood vessels. The covering epithelium was markedly hyperplastic, thrown into irregular folds, and permeated by numerous polynuclear cells. Occasionally, there was respiratory epithelium. There was no evidence of malignancy. Within the polyoid tissue, atrophic bone trabeculae were found, apparently originating from the ethmoid

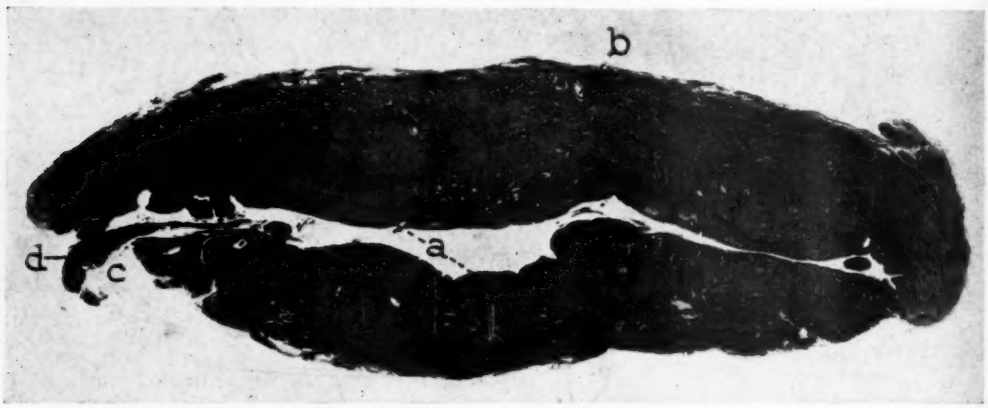

Fig. 9 (Benford and Brunner). Section through the herniation of the frontal mucosa on the right side. a. Squamous epithelium; b. Blood vessels with perivascular infiltration; c. Opening of the sac toward the frontal sinus; d. Fibrin within the opening.

(fig. 10). The margins of the trabeculae were aplastic, and there was a loose connective tissue between them. There was no inflammation of the connective tissue.

Comment. This is a case of chronic, purulent infection of the frontal and ethmoid sinuses in which the infection has ruptured into the orbit. Cases of this type are by no means rare. However, in certain respects the presented case differs definitely from the usual type.

Commonly, an accumulation of pus is found in the sinus, and there is an osteitis, necrosis, and finally a fistula in the osseous wall. Through the fistula, pus escapes into the orbit causing an acute orbital infection which may subside spontaneously, or requires surgery, or eventually causes an intracranial complication. Rarely does the abscess in the orbit become encapsulated. In the presented case, there was an enormous amount of polypi within the sinus while the accumulation of pus was less conspicuous. The osseous wall was perforated on the left side, but it seemed as if this was caused primarily by pressure due to the polypi and not by an osteitis.

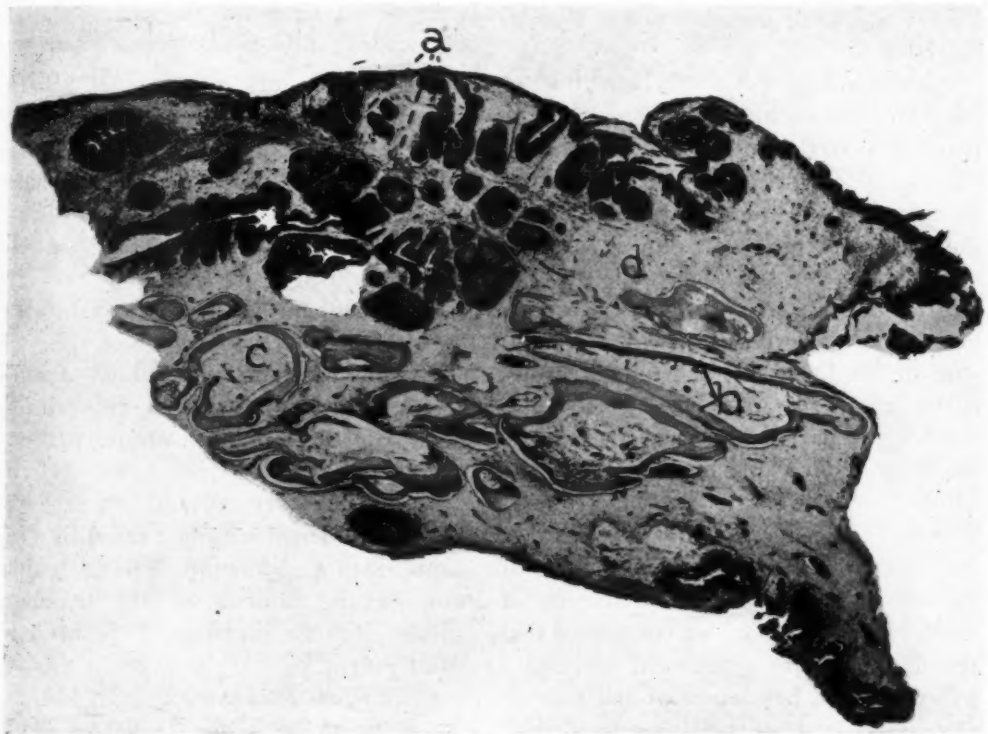

Fig. 10 (Benford and Brunner). Section through the polypus in the left ethmoid. a. Hyperplastic squamous epithelium; b. Atrophic bone; c. Loose connective tissue; d. Edematous connective tissue.

The following findings favor this concept. The patient gave no history of marked headache. If there had been an osteitis, he would have suffered from headache. The bone which was embedded in the nasal polypi was atrophic but did not show signs of inflammation. The margins of the skin fistula in the left upper lid were epithelialized, not granulating. No pus had escaped into the orbit, causing

an orbital inflammation; but polypi and sinus mucosa bulged into the orbit, causing pseudotumors of the orbit. The frontal sinus mucosa which bulged into the right orbit presented only a moderate degree of inflammation. This indicated that the absorption of the underlying bone was due to pressure rather than to infection.

Although absorption of bone due to pressure also occurs when mucoceles or pyoceles extend into the orbit, the tumor mass in the right orbit cannot, in this case, be considered a mucocele or pyocele. In mucocele a large part of the osseous sinus wall—the size depending on the size of the mucocele—becomes atrophic, bulges into the orbit because of the pressure of the mucocele, and ultimately becomes absorbed. In the presented case, there was a narrow fistula in the floor of the frontal sinus, and the margins of the fistula consisted of thickened bone. Through the fistula, a comparatively large sac bulged into the orbit. The outside of the sac did not reveal any remnants of bone. For this reason, we considered that the finding in the right orbit was not a pyocele, but a herniation of the frontal-sinus mucosa. Unless they are caused by a malignancy of the paranasal sinuses, incidences of this type are rare. However, the clinical and microscopic examination did not reveal any signs of malignancy in this case; nor did the long duration of the disease favor the concept of malignancy.

Conclusions

1. Pseudotumors of the orbit (Birch-Hirschfeld) may occasionally occupy the inner and superior angle of the orbit, thus simulating a tumor of paranasal origin.

2. Inflammatory orbital tumors of rhinogenic origin do exist, but they are not as common as acute orbital infections of rhinogenic origin.

3. The inflammatory orbital tumors of rhinogenic origin arise from infections of the ethmoid and/or frontal sinus.

4. Inflammatory orbital tumors of rhinogenic origin may be caused by: (a) a granulating periostitis, (b) a herniation of the mucosa of the paranasal sinuses, (c) an invasion of the orbit by nasal polypi.

1853 West Polk Street (12).
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OBSERVATIONS ON 300 CONSECUTIVE CASES OF OCULAR WAR INJURIES*

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The subject of ocular war injuries is of great importance in military surgery, not only for scientific and humane reasons but also from an economic standpoint. Many of the soldiers with eye injuries become unfit for further military service, as well as for many civilian occupations. Moreover, they form an economic group which requires tremendous expenditures for their postwar care. In modern times each succeeding war has shown an increase in the number of ocular injuries in relation to the number of injuries to all other parts of the body. It must be remembered that the incidence of ocular injury is likely to be underestimated rather than overestimated because many of the cases are associated with fatal head wounds.

It is not surprising that the eyeball, although measuring but 1/375 of the body surface, should be so frequently injured, if one considers the great vulnerability of the eye to small particles. For example, a minute flying particle which would be stopped by clothing or be unnoticed if embedded in the skin may cause a severe injury when it penetrates the eyeball.

It is for this reason that eye injuries form a larger proportion of all types of severe injuries as the distance from the explosion increases. Blake[1] reports that ocular injuries form two percent of all injuries occurring at distances from 0 to 50 feet and 14 percent of all injuries at 150 to 200 feet.

In World War I the incidence of ocular casualties rose to eight percent of all injuries. The data on the number of eye casualties in World War II are not yet available, and estimates by various observers differ widely. Vail[2] states that they comprised about two percent of all injuries in the European Theater. Loewenstein[3] early in World War II found that 12 percent of all injuries were to the eye. Cordes[4] believes that the percentage may even rise as high as 15 to 17 percent. MacFee[5] found that in 141 Air-Force combat casualties 12 percent were ocular injuries. Schench[6] and others surveyed 3,019 casualties on a hospital ship and found that 451 or 15 percent suffered eye injuries. Wiser[7] reports that ocular injuries were present in eight percent of all casualties brought aboard a hospital ship.

The frequency of ocular injuries varies with the type of warfare. During a rapid advance, because the entire body of the soldier is exposed, there are relatively few ocular injuries. Such was the case after the break-through in Normandy. The incidence of ocular injuries rises when the battle front becomes static because the soldiers must take to trenches and foxholes, where the body is protected while the head and eyes are exposed for observation or shooting. This occurred during the campaign on the Italian front.

Other important factors in the rising number of eye casualties in modern warfare are:

1. The increased range and explosive power of high caliber shells and grenades.

2. The use of land mines, which frequently produce bilateral ocular wounds.

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3. The increased use of tank warfare, with the unavoidable exposure of the head and eyes of the tank commander.

It is the purpose of this report to record the findings of 300 consecutive cases of ocular casualties which were observed at a U. S. Army hospital designated as an Ophthalmic Surgical Center.

The modern soldier may receive injury not only in combat but also as the result of noncombat duties (see table 1). Injuries to the eyes caused by flying chips of steel, glass, rock, or sharp implements, similar to those observed in civilian life and industrial practice, require no further mention here. Since ocular injuries caused by explosives during demonstrations or through careless handling are similar to those occurring in combat, they are included.

Shell fragments caused 163 cases, or 54 percent, while bullets produced 34 cases of ocular injury, or 11 percent (see table 1). Rohrschneider,[8] in his report on the eye casualties in the German army, submitted figures surprisingly similar to mine, namely, 56 percent of the injuries were caused by shells and 11 percent by bullets.

Ocular war wounds may be classified as follows (see table 2):

TABLE 1

WAR IMPLEMENTS PRODUCING OCULAR INJURIES AND PROPORTION OF EYE INJURIES TO OTHER INJURIES

Cause of Injury	Injuries to Eyes Only*	Injuries to Eyes, Body, and/or Extremities	Total
Shell fragment	86	77	163
Grenade fragments	10	5	15
Mine fragments	5	18	23
Blast	6	4	10
Shell fragments and blast	—	1	1
Grenade fragments and blast	1	—	1
Small arms fire	26	8	34
Explosions	5	5	10
Vehicles	3	4	7
Planes	2	—	2
Flying particles (glass, rock, debris, sand, etc.)	18	2	20
Sharp instruments	3	—	3
Blunt instruments	7	—	7
Burns	—	3	3
Fall	1	—	1
Total	173	127	300

* In 52 soldiers the injuries were bilateral.

1. Injuries caused by air blasts or burns.

2. Concussion waves reaching the eye through the tissues caused by direct impact upon adjacent structure or, less frequently, a more distant point.

3. Direct impact of a missile upon the eyeball.

TABLE 2

CAUSES OF INJURY IN 300 CONSECUTIVE OCULAR WAR CASUALTIES

Type of Injury	Number	Type Total	Total
I. Blast injuries			13
II. Indirect injuries			40
III. Direct injuries			
(a) Nonpenetrating injuries to eyeball		54	
(b) Penetrating injuries to eyeball			
1. Avulsions, ruptures, lacerations requiring immediate enucleation	104		
2. Penetrating injuries with retained foreign body	65		
3. Penetrating injuries without retained foreign body	37	206	
(c) Direct injuries to lids, extraocular muscles, orbit		30	= 290
IV. Burns of eyeball and lids			9
Total			352*

* In 52 cases the injuries were bilateral.

Blast injury to the eye

Injury to the eye by shells, grenades, or mines is usually due to the effect of fragmentation; however, severe ocular trauma can also be caused by an explosive force. A simple ocular blast injury shows no trace of a foreign body. Frequently, however, dust, débris, and other particles are driven into the eye by the blast. In such cases, it is difficult or impossible to distinguish between the damage caused by the blast and that caused by the flying particles.

Campbell[9] describes the blast due to bomb explosion as a sudden compression and expansion of the atmosphere. The eye and ear are particularly vulnerable because of the exposed position of the eye and the physiologic adaptability of the ear to receive pressure. Bonnet[10] believes that the injury is produced by the shock of the advancing air wave generated by the explosion. Young[11] explains the damage following blast injuries as due to the sudden increased pressure, which may rise as high as several atmospheres. This pressure is applied to all the surfaces of the body. There is no unanimity of opinion regarding the incidence of blast injuries to the eye. Zuckerman[12] doubts that blasts are a common cause of ocular injuries and gives as a reason that if an individual were close enough to an explosion to receive ocular damage from the blast, his injuries would be fatal.

Fig. 1 (Bellows). Bilateral iridodialysis caused by an explosive blast.

Further, he has found that most individuals exposed to high blast pressure fail to demonstrate ocular injuries.

On the other hand, Wiener[13] writes that rupture of the choroid without even a bruise of the external eye or lids results not uncommonly from explosive forces. He describes a case of aneurism of the lateral sinus following an explosion. Vail[2] also found that blast is a frequent cause of ocular injuries (fig. 1).

These changes have been observed in blast injuries: Chemosis; hemorrhage leading to proptosis and optic atrophy; intraocular hemorrhage resulting from iridodialysis or the rupture of a retinal vessel; choroidal rupture and retinal hemorrhage, and acute iridocyclitis with secondary glaucoma.

In the 300 cases in this report there

TABLE 3

THE MAIN OCULAR LESIONS AND RESULTING VISUAL ACUITY IN 13 CASES OF BLAST INJURY

	Below 20/200	20/200 to 20/40	20/30 or Better	Total
Optic-nerve atrophy	2	—	—	2
Choroidal and retinal lesions	2	—	—	2
Intraocular hemorrhage or vitreous opacity	1	1	—	2
Changes in the lens	—	2	—	2
Changes in the iris and pupil	—	1	3	4
Extraocular muscle paralysis	—	—	1	1
Total	5	4	4	13

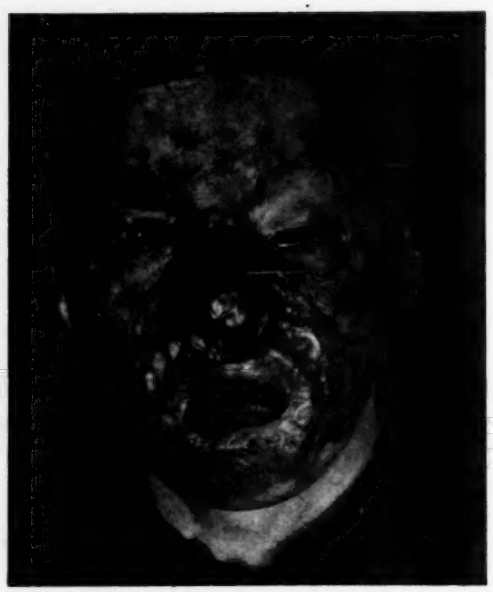


Fig. 2 (Bellows). Airplane crash and fire caused burns of face, lids, and eyeballs.

were 13 soldiers who suffered from severe ocular trauma due to nearby explosions. Only those patients exposed to a blast, in whom there were no apparent injuries by impact or penetration of a foreign body and yet who showed serious ocular pathologic conditions, were considered as blast injuries. Table 3 shows the chief ocular lesions and resulting visual acuity following blast injuries to the eye.

Thermal injuries

There were three soldiers in this group who suffered from burns. Gasoline fire caused the burns of two of the men. The third was injured when his plane crashed and caught fire.

The lids were markedly affected and corneal opacities were present in all three (fig. 2).

Indirect ocular war injuries

This type of injury generally results from the enormous kinetic energy of a rapidly moving missile striking tissues in the vicinity of the eyeball. Powerful concussion waves produced by the projectile cause severe ocular lesions. Thus, a rapidly moving projectile passing through the orbit without striking the globe may produce a rupture of the eyeball opposite the point of impact. For example, a projectile penetrating the retrobulbar region may give rise to a rupture of the cornea, and one passing lateral to the globe may

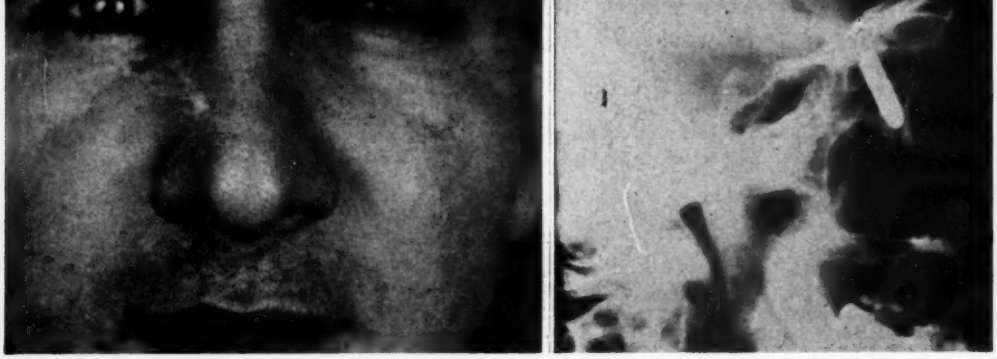


Fig. 3 (Bellows). Bullet in retrobulbar region caused choroidal rupture with atrophic chorioretinitis. Enophthalmos is present.

cause rupture near the opposite equator. Kaminskaya[14] finds that indirect ocular injuries occur most commonly following injuries of the lower outer orbital margin and the zygomatic arch. Ocular lesions resulting from injuries of the inner orbital wall and nose are less frequent.

The lesions resulting from this form of indirect injury involve the posterior segment more often than the anterior. The explanation for this occurrence, according to Lagrange,[15] is that the macular area is the most fragile and vulnerable region and that the concussion waves toss the eyeball about within the orbit, causing traction on the optic nerve to produce posterior lesions (fig. 3).

Symptoms naturally vary with the extent, location, and nature of the lesions. They may appear immediately or may not become evident for days or even months. Intraocular hemorrhages are frequently present although peripapillary and macular hemorrhages are more common. Kaminskaya[14] believes that the injury which produces subluxation of the lens in the anterior segment causes, in the posterior segment, a reverse wave which separates the vitreous and the retina. This produces a vacuum which, in the presence of the alterations in the vessels (spasm followed by dilatation and increased permeability), leads to hemorrhages. Edema of the disc and retina with choroidal rupture are frequently encountered (fig. 4). Lister[16] terms "grossly concussioned fundus" a lesion which in the early stages is characterized by hemorrhagic clouds, white particles which represent patches of coagulation necrosis from rupture of choroidal and retinal vessels. These patches change gradually into fibrous tissue. Later, secondary lesions appear, consisting chiefly of atrophic and proliferating chorioretinitis.

Purtscher[17] was the first to call attention to an interesting form of indirect ocular injury which is now known as "traumatic liporrhagic retinalis." Cases have been reported resulting from fracture of the vertebras or compression injuries to the thorax and abdomen. Purtscher[17] explains the pathogenesis of the retinal changes as follows: Compression of the longitudinal axis of the spine due to head injury increases the cranial pressure; the pressure is transmitted along the intervaginal space and then into the nerve head; this results in an extravasation of fluid into the retinal spaces. The more recent authors attribute the changes to fat emboli. Friedenwald.[18] Urbanek,[19] Loewenstein,[20] Verhoeff,[21] and Spaeth[22] think the retinal changes are due to a generalized diffusion of fat droplets in the fundus. Therefore, the term "traumatic liporrhagic retinalis" has been applied to this condition. The usual ophthalmoscopic findings consist of hemorrhages, exudate, and edema with destruction of the arteries and dilation of the veins.

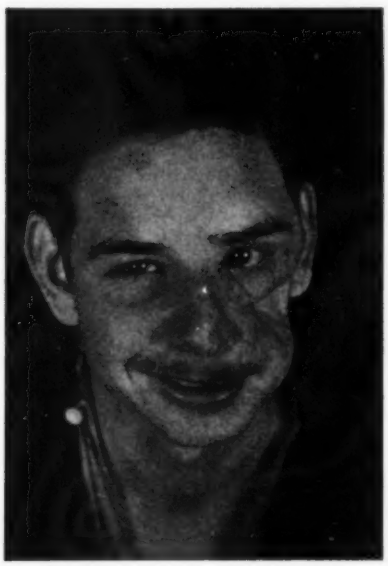
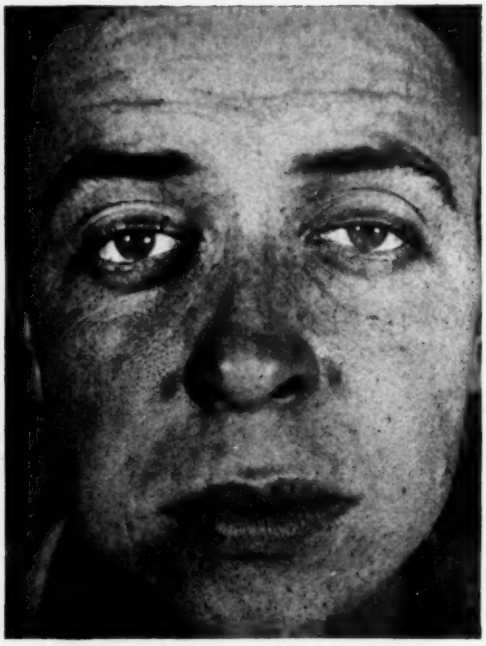


Fig. 4 (Bellows). Shell missile injury to face producing ipsolateral choroidal rupture.

Finally, ocular alterations occur indi-



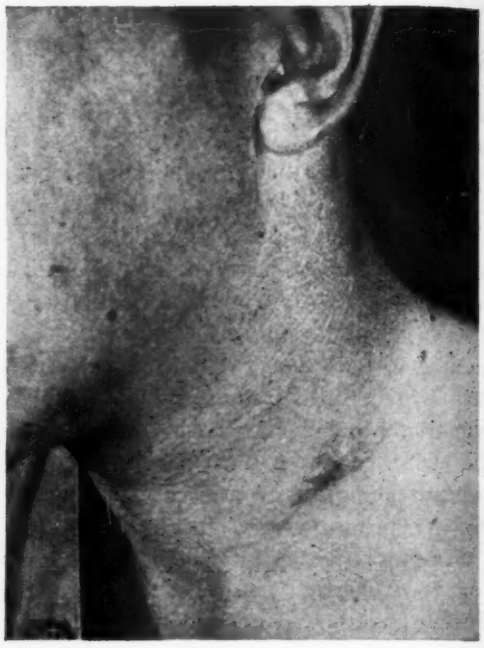


Fig. 5 (Bellows). Horner's syndrome following a wound in the supraclavicular region.

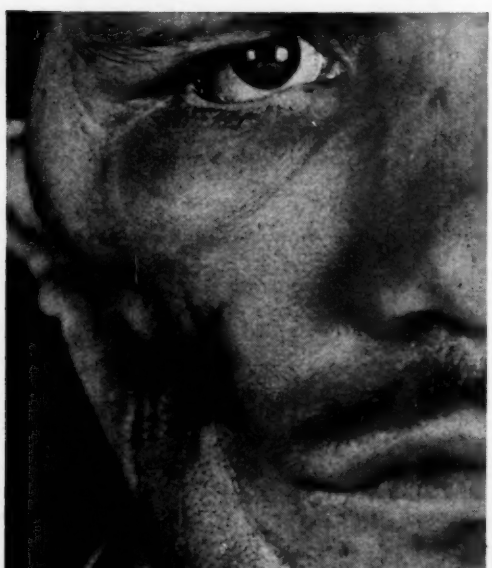


Fig. 6 (Bellows). Paralysis of the orbicularis oculi following shell injury in the parotid region.

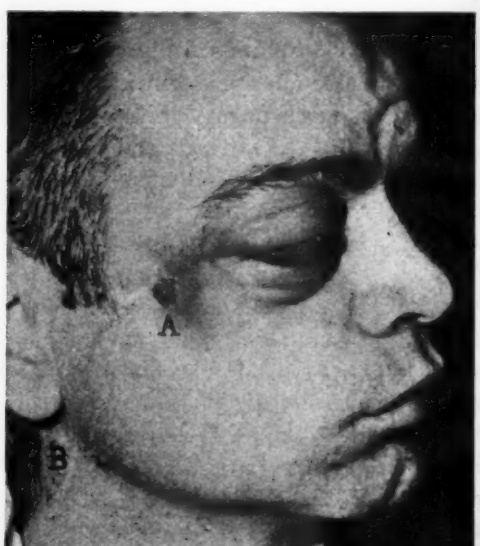


Fig. 7 (Bellows). Pulsating exophthalmos resulting from shell injury. A, Point of entrance. B, Point of exit.

rectly as a result of injuries to nerves or blood vessels supplying the globe and its adnexa. Thus, Horner's syndrome follows injury in any portions of the sympathetic such as in wounds of the neck (fig. 5). Paralysis of the orbicularis oculi results from injury to the facial nerve (fig. 6). Pulsating exophthalmus may follow an injury which ruptures the internal carotid artery in the sinus cavernosus (fig. 7).

In the 40 cases of ocular alterations produced by indirect injuries, the chief ocular lesions were intraocular hemorrhage and changes in the vitreous, choroid, retina, and optic nerve (see table 4).

Direct or contact ocular injuries

A direct or contact injury is produced by the impact of a missile upon the eyeball. Contusion, perforation, penetration (with or without retention of a foreign body), laceration, or avulsion are forms of direct or contact ocular injuries that were observed. Frequently secondary missiles, such as debris, sand, gravel, wood, or glass, set in motion by the explosion, cause far more damage than the primary missile (fig. 8).

If the impact of the missile is of insufficient force to cause perforation, penetration, or rupture, it produces signs and symptoms of a contusion injury. When the force is adequate, the missile perforates or penetrates the globe or causes a rupture of the eyeball. At times the missile carries away part or all of the eyeball, thus producing a partial or total avulsion of the globe.

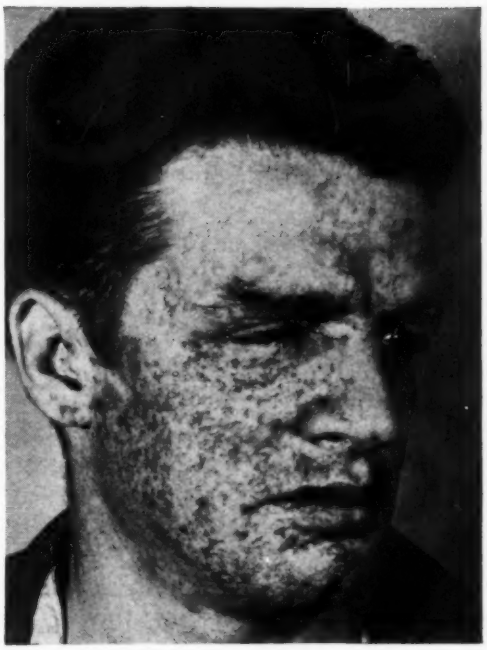


Fig. 8 (Bellows). Injury to face, lids, and eyes produced by secondary missiles (debris and sand).

Bullets produce more severe ocular injuries than do fragments of shells, mines,

TABLE 4

Principal ocular changes with resulting visual acuity following concussion injuries

	Enucleation	Nil	Below 20/200	20/200 to 20/40	20/30 or Better	Total
Rupture of globe	1	—	—	—	—	1
Phthisis bulbi	—	—	1	—	—	1
Atrophy or avulsion of optic nerve	—	5	3	2	—	10
Ophthalmoplegia	—	—	—	1	—	1
Choroidal and retinal lesions	—	—	6	2	5	13
Intraocular hemorrhage or vitreous opacity	—	—	1	3	1	5
Lens changes	—	—	1	1	—	2
Dilatation of the pupil	—	—	—	—	5	5
Horner's syndrome	—	—	—	—	1	1
Muscle paralysis	—	—	—	—	1	1
Total	1	5	12	9	13	40

or grenades. Thus, in World War I, according to Mills,[23] not more than 25 to 30 percent of ocular casualties caused by bullets were saved, while about 60 percent of shell injuries were saved. In the 198 direct eye injuries by shells, grenades, and mines in the series reported in this paper, enucleation was necessary in 105, or 53 percent. In 25 cases of direct injury by bullets, 16, or 64 percent of the eyes were lost.

The disorganization of the globe when struck directly by a velocity projectile is caused by the propagation of the velocity of the projectile to the globe with its incompressible fluids. Mills states that "velocities being equal, the smaller the eye, the greater the destruction." Harvey and others[24] have recently shown that when a velocity missile strikes soft tissues it results in a series of phenomena comparable to that oberved in water or a gel. The liquid is first compressed. This area of compression precedes the missile as a shock wave. The missile forces the media aside as well as forward, thus producing a conical cavity. In the tissues, the cavity fills with blood and tissue debris. Blood extravasates into the tissue spaces. In the region away from the cavity the chief damage is the rupture of the capillaries.

Nonpenetrating or contusion injuries

Contusion injuries caused by the impact of missiles vary from a slight corneal abrasion or foreign body embedment in the cornea, conjunctiva, or sclera to rupture of the globe. Contusion injuries are produced chiefly by a nonperforating direct or glancing blow by a missile. Markelova[25] reports that 58 percent of ocular military injuries are nonperforating. Under the term "the traumatic syndrome of the anterior segment of the eye," Frankel[26] groups the symptoms and findings of contusion injury as follows: Hyphemia, deep anterior chamber; changes in the iris consisting of tears, iridodialysis, rupture of the pupillary margin, iridodonesis; pupillary alterations, mydriasis or deformity; dislocation and cataract formation of the lens. Leplat,[27] in an experimental and clinical study of contusion injuries, reports that following a contusion there is a variation in ocular tension, an increased protein content in the aqueous humor, spasmodic miosis, and congestion of ciliary and conjunctival vessels.

Hypotony is a frequently occurring symptom. DeSchweinitz[28] warns against the common conception that this finding necessarily signifies a perforating wound. Collins[29] believes the decreased tension is due to escape of intraocular fluid through expanded exit channels or to arrest of secretion because of paresis of intraocular nerves. According to this author, hypotony causes some of the conditions ordinarily ascribed to trauma. Striate keratitis and pigmentary changes in the choroid and retina are caused by the wrinkling of the elastic lamina of the cornea and choroid, respectively. Frequently overlooked, according to Kilgore,[30] are the alterations in the ciliary body after contusion of the globe. Edema, round-cell infiltration, pigment migration, and scar-tissue formation are observed in the ciliary body after several days. These changes explain some of the permanent visual disturbances following a blow of moderate degrees. The lesions resulting from contusion injuries in warfare differ from those seen in civilian life because the velocity of the striking force which causes war injuries is so much greater. Twenty-seven individuals out of the 300 cases received ocular injury by contusion. The following lesions were observed in this group. In 11 eyes, the chief lesion was in the posterior seg-

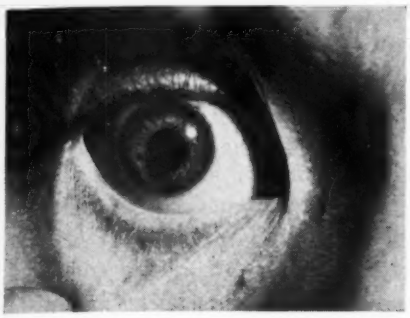


Fig. 9 (Bellows). Contusion injury causing changes in pupil and lens.

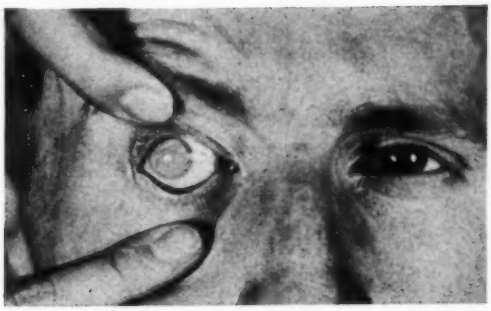


Fig. 10 (Bellows). Corneal scar following a contusion.

ment—six eyes showed chorioretinitis; one, macular hole; one, choroidal rupture; two, optic atrophy; and one, avulsion of the optic nerve. There were six cataracts; in one eye, the cataractous lens was dislocated (fig. 9). In four eyes, the main alteration was in the cornea, resulting in opacities (fig. 10). The visual acuity resulting from contusion injuries is shown in Table 5.

Penetrating injuries of the globe

Penetrating injuries are more likely to involve the cornea than the sclera. Savin and others[31] found that of 36 patients all but five had corneal or corneoscleral injuries. According to Verhoeff,[32] the flying missiles strike the pupillary area less often than other parts of the cornea because the former makes up only a small part of the total corneal surface.

The lesions produced by a missile which perforates the ocular coats or penetrates

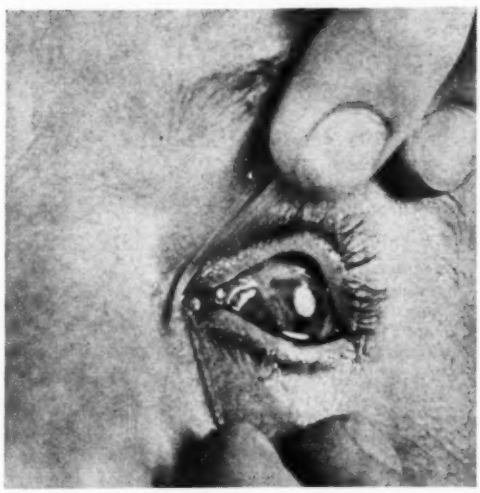


Fig. 11 (Bellows). Penetrating injury of the globe by a high-velocity-shell particle.

deeply into the globe are usually severe (fig. 11). The more serious lesions characterized by the collapse of the globe are considered with lacerations and ruptures of the eyeball. The changes resulting

TABLE 5

Complications and visual acuity following contusion of eyeball

	Nil	Below 20/200	20/200 to 20/40	20/30 or Better	Total
Optic-nerve lesions	1	2	—	—	3
Choroidal and retinal lesions	—	4	1	3	8
Intraocular hemorrhages	1	4	1	—	6
Lens changes	—	3	1	2	6
Corneal opacities	—	—	1	3	4
Total	2	13	4	8	27

from a penetrating ocular injury vary according to the size and velocity of the traumatizing agent, the depth of penetration and the site of the wound.

With the exception of very small wounds, a corneal perforation causes an outrush of aqueous, which carries the iris forward. Frequently the iris is incarcerated in the corneal wound or may actually prolapse out of the wound. The lens very often becomes opaque. Hemorrhage either occurs in the track of the missile or is more widespread within the jects into the vitreous. Some darkly pigmented areas may cover part of the mass.

Corneoscleral penetrations offer the gravest prognosis, for in these cases both the anterior and vitreous chambers are opened with subsequent loss of aqueous and vitreous and exposure to infection. Prolapse of iris, ciliary body, and vitreous are common complications. Subluxation of the lens follows injury to the zonule. When the injury is in the ciliary region, there is a distinct danger of

TABLE 6

COMPLICATIONS AND VISUAL ACUITY RESULTING FROM PENETRATING INJURIES (WITHOUT RETENTION OF FOREIGN BODY)*

	Enucleation	Nil	Below 20/200	20/200 to 20/40	20/30 or Better	Total
Intraocular hemorrhage and vitreous opacities	6	3	5	1	1	16
Endophthalmitis	2	1	—	—	—	3
Phthisis bulbi	6	4	—	—	—	10
Adherent leukoma	1	—	1	1	1	4
Corneal opacities	1	—	5	1	1	8
Iris lesions	3	1	6	—	1	11
Pupillary lesions	—	1	—	—	—	1
Cataract	2	—	8	1	2	13
Lens dislocation	3	1	2	—	—	6
Chorioretinitis	—	—	2	3	1	6
Choroidal rupture	—	—	1	—	—	1
Retinal detachment	—	—	1	—	1	2
Retinal hemorrhage	—	1	2	—	1	4
Sympathetic ophthalmia	1	—	—	—	—	1
Total	25	12	33	7	9	86

* Some globes showed two or more serious lesions.

globe. Choroidal and optic-nerve lesions are produced either because the penetrating agent strikes these structures directly or because the structures undergo early or late changes due to edema, inflammation, hemorrhage, or infection. Traumatic proliferative choroiditis is a condition frequently observed in wartime. Michaelson and Kraus[33] observed such lesions in 6 of 7 cases in which a double penetrating injury was incurred. If the media is clear, a white mass is observed in a choroidoretinal atrophic area. The mass appears solid and prosympathetic ophthalmia, particularly if prolapse of the iris and ciliary body is present.

There were 206 eyes with penetrating injuries in the 300 cases in this series. The injuries in 104 of these were so severe that enucleation of the globe was required shortly after the injury. This group is considered with avulsions, ruptures, and lacerations of the eyeball. Furthermore, there were 65 eyes in which the penetrating injuries were complicated by retained foreign bodies; these are considered in the section of intraocular

foreign bodies. There were 37 eyes with a penetrating injury in which the foreign bodies were not retained. Table 6 presents the ocular lesions observed in the latter cases.

Rupture of the eyeball

Rupture of the globe, including laceration and partial avulsion of the eyeball, produces the clinical features of a collapsed and disorganized eyeball. If observed early, there is a marked swelling of the lids, severe chemosis, and limitation of motion. The latter is due to retrobulbar hemorrhage. Lister[16] distinguishes between rupture of the globe resulting from a blow by a slowly moving body, which strikes the eye directly, and rupture arising from an injury produced by a missile travelling at a great velocity through the orbit. In the former instance, the break occurs "in the equator around the line of impact, at a point where the globe is least supported;" in the latter type, the force is transmitted to the globe and causes rupture, usually at a point of contrecoup. Finally, rupture of the eyeball may be caused by a missile passing through it. If the projectile is large and is travelling at a high speed, it may cause an extensive laceration of the globe or

TABLE 7

Associated injuries and complications accompanying rupture, avulsion, or severe lacerations of eyeball

Complication	Number
Lid laceration	28
Lid laceration and orbital fracture	18
Lid laceration and orbital cellulitis	2
Lid laceration and burn of lids	1
Lid injuries associated with orbital fracture and retained intraorbital foreign body	4
Lid laceration and dacryocystitis	1
Orbital foreign body alone	4
Orbital fracture alone	10
Orbital fracture with dacryocystitis	1
No injuries to orbit or adnexa	36
Total	105

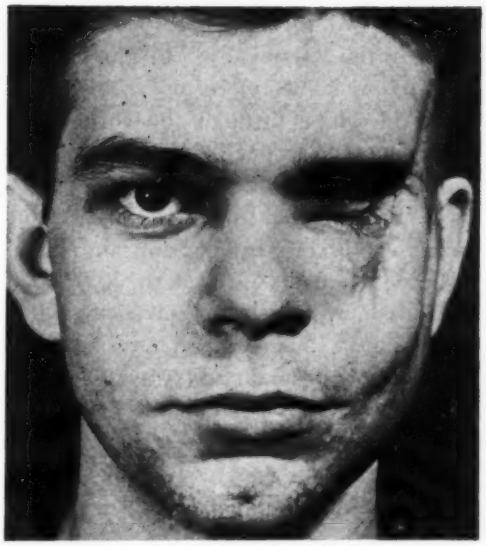


Fig. 12 (Bellows). Fracture of orbit, rupture of eyeball, and laceration of lids and surrounding soft tissues caused by a high-velocity-shell fragment.

even avulsion of the eyeball. There were 105 eyes belonging to this group of trauma, all of which required primary enucleation or early secondary enucleation. In all but 36, there were wounds of the surrounding soft tissues, fracture of the orbit, or intraorbital foreign bodies (see table 7 and fig. 12).

Intraocular foreign bodies

Penetrating injuries with a foreign body retained within the globe form both a large and an important proportion of ocular casualties. Dansey-Browning[34] reports 67 cases of intraocular foreign bodies in a series of 514 ophthalmic battle casualties.

Stallard[35] reported 105 cases of intraocular foreign bodies and found that the right eye was injured in 41 cases, the left in 34, and both eyes in 30. As in all types of penetrating injuries to the eyeball, the cornea is the most frequent site for the entrance of the foreign body. In 56 of Stallard's cases, the foreign

body entered through the cornea; in 42 through the sclera; and in three cases the foreign bodies were multiple and entered the globe through the cornea and sclera. Trevor-Roper[36] found the site of entrance to be through the cornea in 100 eyes, across the limbus in 11, and through the sclera in 15. Scott and Michaelson[37] stated that 76 out of 301 ocular casualties suffered from intraocular foreign bodies. There were two bilateral cases. The wound of entry was through the cornea in 37 percent; the limbus in 33 percent; the sclera in 26 percent; and undetermined in 4 percent.

Intraocular foreign bodies were found in 65 eyeballs in this group of 300 soldiers with a total of 352 eye injuries. The left eye was involved in 32 cases, the right eye in 29, and both eyes in two. The reason for the small number of bilateral involvements observed at this hospital is that soldiers with bilateral eye injuries with visual acuity in the better eye of 20/200 or less were sent to other installations. Those eyes with foreign bodies which were so badly disorganized as to require primary enucleation are not included here.

The intraocular foreign bodies encountered in military ophthalmology differ from those observed in civilian or industrial practice in that bilateral involvement is more frequent and that the particles are usually smaller, multiple, and nonmagnetic or weakly magnetic. In contrast to the smooth surfaces of chips from punches, hammers, chisels, and so forth, which cause a great number of industrial cases, fragments from projectiles are generally irregularly shaped, with ragged edges and rough surfaces.

Shell and bomb fragments are generally magnetic but of low degree, while fragmentations of grenades, booby traps, and land mines are poorly magnetic or not at all. There is a wide divergence of opinion as to the proportion of magnetic to nonmagnetic foreign bodies. Comparing 125 cases of intraocular foreign bodies due to war injury with as many case of industrial injuries, Pokrowsky[38] found that only 45 percent of the former group were magnetic as compared to 85 per cent in the latter group. In 78 cases reported by Gasteiger and Schmidt,[39] they found only four that responded to the magnet, and of these, two were industrial war injuries and not field injuries. Stallard,[32] in 105 cases of intraocular foreign bodies, found 66 were nonmagnetic and 39 were magnetic, of which the majority were magnetic to only a slight degree. Wiener,[13] too, remarks upon the extremely low incidence of magnetic intraocular foreign bodies encountered in World War II.

The intraocular foreign bodies are nearly always of small size. The reason for this is that the larger projectile, because of its high velocity, disorganizes the eyeball to such a degree that immediate enucleation is required. Stallard[32] found the majority of foreign bodies measured 2×3 mm., or less. The foreign bodies were measured in 19 eyes in the series reported herein, and it was found that 16 were 2 mm. or less in the largest dimension. The three largest particles were 1×3, 2×4, and 5×6 mm.

The clinical features produced by intraocular foreign bodies depend upon such factors as the number, size, and location of the foreign body; the presence of intraocular hemorrhage; infection or prolapse of vitreous, lens, or uveal tissue; and alterations in the media, fundus, and optic nerve. Another important factor is whether the foreign body is well tolerated or whether it calls forth an inflammatory reaction. Depending upon these conditions, the lesion produced by a foreign body may be very slight or so extensive as to require enu-

cleation of the eyeball. If the wound is recent, examination may reveal the point of entrance. Slitlamp examination in some instances reveals the path of the foreign body and the place of lodgement. A small perforation through the sclera frequently escapes detection. A foreign body lying within 3 mm. from the center of the cornea is considered to be anterior to the lens; if it is situated between 3 and 7 mm., it lies within the lens; between 7 and 24 mm., it lies within the vitreous humor.

If the eye is preserved and the foreign body is retained, other symptoms may arise, depending upon the nature of the foreign body. Particles rich in iron differ from other intraocular foreign bodies in that they are magnetic and are capable of producing siderosis bulbi. Since iron and iron-containing foreign bodies are usually removed early, siderosis is seldom observed. In this series of 65 cases of intraocular foreign bodies, only three eyeballs showed siderosis bulbi. Copper also deserves special mention since it frequently produces either severe purulent reaction or chalcosis bulbi. Chalcosis bulbi was present in two soldiers. In one, a nonbattle injury, the lesion was bilateral; in the other, only one eyeball was involved. Miekle[40] reports that aluminum, which produces an abscess in the skin, is paradoxically well tolerated in the eye. Wiener,[41] agreeing with this observation, recommends that no attempt be made to remove intraocular foreign bodies of aluminum. Minute particles of rock, glass, and lead are well tolerated by the eye.

Table 8 shows the most important pathologic lesions resulting from 65 cases of intraocular foreign bodies. Some eyes showed multiple severe lesions. The most common causes for the loss of visual acuity in eyes which have been injured by an intraocular foreign body are cataract; corneal opacities, including adherent leukoma, intraocular hemorrhage, and vitreous opacities; phthisis bulbi; and lesions in the iris, retina, and choroid.

A factor of prime importance in the proper management of intraocular foreign bodies is accurate localization. Fortunately, most intraocular foreign bodies resulting from war injuries cast a shadow on X-ray films. The two chief exceptions are the secondary missiles, stone and glass, and even these are detectable by special methods such as Vogt's[41] bone-free technique. Bone-free roentgenograms as recommended by Vogt are of particular value if the foreign body lies in the anterior 8 to 12 mm. of the globe. Since the apex of the cornea or the plane of the corneal limbus is used as a point of reference, it is sometimes difficult to determine if a foreign body near the posterior pole lies in or out of the eyeball. Moreover, it is well-known that refractive errors and variations in the size of the eyeball make for the possibility of error. In such cases the injection of air (Spackman[42]) or oxygen (Scheie and Hodes[43]) into Tenon's capsule gives valuable information.

TABLE 8

THE CHIEF PATHOLOGIC LESIONS OBSERVED IN 65 CASES OF INTRAOCULAR FOREIGN BODIES*

Lesions	Number
Intraocular hemorrhages	17
Vitreous opacities	7
Endophthalmitis	4
Phthisis bulbi	13
Corneal opacities	18
Adherent leukoma	9
Iris and pupillary lesions	20
Cataract	30
Chorioretinitis (atrophic or proliferative)	11
Choroidal rupture	3
Retinal detachment	8
Macular hole	1
Avulsion of optic nerve	1
Chalcosis bulbi	2
Siderosis bulbi	3
Sympathetic ophthalmia	1

* Some eyes showed two or more serious lesions.

In some cases, the Berman Metal Locator was of considerable value in localizing the intraocular foreign bodies. Since the instrument yields a response only if the probe is very near to a magnetic particle, a negative reaction does not preclude the possibility of the presence of a nonmagnetic foreign body, for the magnetic foreign body may be deep within the globe.

The posterior surgical approach was employed in nearly all instances. The great advantage of this method, an advantage that outweighs all possible disadvantages, is the fact that it places the magnet as near the foreign body as possible. This was particularly desirable because the foreign bodies were frequently poorly magnetic. The sclerotomy wound was always ringed with diathermy applications as a safeguard against retinal detachment.

In the series of the 65 eyes with intraocular foreign bodies herein reported, 29 were magnetic and were removed. In four eyes however, one or more other particles remained within the globe, indicating that a combination of magnetic and nonmagnetic foreign bodies existed in the same eyeball. In 36 eyes, the foreign body did not respond to one or more attempts at removal with the magnet and were considered nonmagnetic. In some instances, subsequent enucleation of the eye confirmed the nonmagnetic nature of the foreign bodies.

The following summarizes the results: In 20 cases, the eye was finally enucleated; in four, the eye, although preserved, was totally blind; in 22, visual acuity was less than 20/200; in 13, visual acuity was between 20/200 and 20/40; in six, visual acuity was 20/30 or better.

30 North Michigan Avenue (2).

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NOTES, CASES, INSTRUMENTS

PRESSURE EFFECTS IN CONTACT LENSES

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The first contact lenses, the Müller lenses, were made by a glass-blowing process, similar to that for making artificial eyes. Neither the corneal section nor the scleral section of these lenses was made with any degree of scientific accuracy. In spite of this, however, the occasional successes which these lenses afforded, especially in cases of conical cornea, spurred on further research. The next step was completely opposite, the Zeiss glass ground lenses in which both the corneal section and the scleral section were ground with scientific precision.

The corneal section perfected by precision grinding more than 30 years ago has not been improved upon except that the corneal section is now made of plastic. The scleral section, however, ground as it was on spherical tools gave but a limited number of successful fittings. Subsequent improvements in contact lenses concerned themselves chiefly with perfecting the scleral portion so as to make the lens more comfortable to the wearer.

As the spherically ground scleral section did not prove satisfactory in most cases, a toric system of scleral curves was designed. These yielded a greater number of successful fittings than the spherical curves had, but they still fell far short of solving the problem of a comfortable scleral fit.

The idea was then conceived that if the scleral portion of the lens was made from a mold or impression of the eye it would give a good comfortable fit. The idea seems reasonable, but in practice has not worked out. Most of the lenses made from a mold exert too much pressure on the eye and a great many are uncomfortable. This occurs in spite of numerous adjustments, stretching over months and months, during which the lenses are ground out, tightened, loosened, and so forth.

In the search for a better scleral section, the idea was conceived to make the bearing surface of the scleral section a portion of a cone. A lens was designed so that the bearing, conic section touched the sclera on a tangent, resting only on a narrow rim of 1 to 2 mm. This has proved very satisfactory and caused a revision of one of the cardinal principles which governed contact-lens fitting.

From the earliest days of contact-lens fitting, it has been assumed that the larger the bearing surface of the lens on the eye the more comfortable the lens would be. The idea was that the larger bearing surface would distribute the pressure over a larger area of the eye and thus produce minimum pressure everywhere.

But the idea, plausible as it sounds, is based on a fallacy, as the following illustration will show. If we take a 20-pound weight and place it on one square foot of a table, 20 square feet in area, this square foot of the table will be under a pressure of 20 pounds, while the rest of the table will be under no pressure. The table will suffer some distortion because of the uneven pressure on it. If we now break up the 20 pound weight into 20 parts and place each pound on one square foot of the table, the pressure will be evenly distributed and the table will suffer no distortion. This is perfectly true of gravity pressure.

The pressure of a contact lens on the eye, however, is not gravity pressure. It is an adherent force or adherent pressure,

for want of a better term. Such adherent pressure interferes least with the functions of the eye when it is limited to a small area. In other words, the principle is reversed. The smaller the bearing surface exerting this adherent pressure, the more comfortable the lens is on the eye. This principle is utilized in the tangent-cone contact lens. The bearing surface of the scleral portion is part of a cone which rests tangentially to the eyeball. It is adherent only over a narrow rim of 1 to 2 mm.

The clue to this principle of fitting came from observations made on impression molded lenses. It was found that, when these lenses were adjusted so as to fit the sclera "like a glove," they were more uncomfortable than when they were adjusted so as to have a smaller bearing surface more or less tangential to the eyeball. Following up this clue led to the design of the tangent-cone lens.

37 West 97th Street (25).

PLASTIC VISUAL TEST PLATES

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Exact measurement of visual acuity is seldom necessary in routine refraction. An approximation is usually all that is needed, since it makes little practical difference whether an individual's uncorrected vision is 20/200 or 20/100, and since the refractionist's ultimate aim is to obtain the best possible corrected vision regardless of which line on the chart this may be.

There are occasions, however, on which it is of considerable importance to have as nearly exact records of visual acuity as is possible to obtain. In the Armed Forces, for instance, a difference of one line on a test chart may alter a man's physical classification or may disqualify him for a desirable position. In civil life a somewhat comparable situation may arise in compensation cases. Again, in an orthoptic clinic, careful follow-up of cases undergoing occlusion necessitates an accurate and consistently reproducible method of determining vision.

A particular problem is that of individuals who profess to better uncorrected vision than would be expected by the degree of refractive error which they possess. These are usually candidates for positions or schools which require a high standard of visual acuity. A determined patient, aware of poor vision, will often go to extraordinary steps to pass these tests. Memorization of charts and other stratagems are well-known. The usual types of wall charts are of course easily memorized. Projecting instruments lend themselves less readily to memorization in the lines which represent high visual acuity, but there is little chance for the examiner to vary or alternate letters in the 20/100 to 20/400 lines, a region in which critical evaluation may be all important.

As has been pointed out repeatedly, most of the charts now in general use do not remove the factor of recognition inherent where letters or numbers are employed. The need for standardization of test charts has also been emphasized. Most observers[1-3] favor some modification of the Landolt ring test, this being a figure which meets the criteria of Snellen in all meridians, including the critical detail of one minute of arc, as well as the gross overall figure of five minutes of arc. The factor of recognition does not enter as it does with letters. It has been stated that the break in the Landolt ring might be detected by its increased luminosity before its form could be actually

distinguished. Nevertheless, its advantages as compared to the other test symbols now in use would appear to outweigh its disadvantages. Fink[2] has recently described individual test plates printed on round pieces of cardboard and viewed in reflected light at an illumination of 15 foot-candles. Such printed

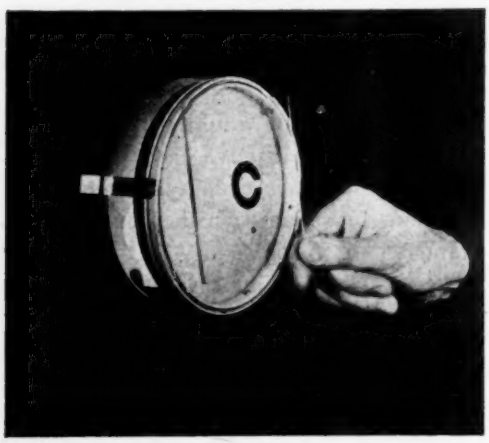

Fig. 1 (DeVoe and Dietz). Plastic visual test plate in use.*

cards used by the same examiner under the same conditions should produce excellent results. When many copies of any cards are printed, inevitable variations appear in the reflection factor of the background, letter itself, finish of its surface, and type of ink. When the cards become dirty or worn with use, further inaccuracies may appear.

In order to obtain a test which would be practical, accurate, easily adaptable to varying surroundings, and with the particular factor of being unlearnable, the following plates were devised using both the illiterate E and the Landolt single-break ring (fig. 1).

A diffusion screen was constructed of two layers of 10/1,000-inch double-matte plastacele in such a manner as to readily clamp upon a reflector shield of a standard gooseneck desk lamp. This, when used in conjunction with a 15-watt frosted bulb, has given evenly diffused lighting of about 25 foot-candles in intensity.

Test figures were cut from 10/1,000-inch vinyl copolymer (vinyl chloride and vinyl acetate). These figures were then laminated to ⅛ x 4 x 4-inch lucite plates by use of a laminating press. Lamination was effected at 140° C. for 30 seconds at 4,000 lbs. pressure, and the pressure then increased to 6,000 lbs. for 15 seconds. After release of the pressure, the lucite plates were pulled off the metal plates while hot and allowed to cool on a cold metal pate. The Snellen value of the figures may be conveniently scribed on a corner of the lucite plates by using a metal trylon stylus in a lettering device. Any desired figures can be adapted to this process.

Summary

The visual test plates herein described have the following advantages:

1. They present clear, accurate images under constant conditions of illumination.
2. They are unbreakable and will withstand use without loss of efficiency.
3. They are unlearnable.

635 West 165th Street (32).

* A modification of these plates may be obtained from A. Haustetter, Inc., 2 East 45th Street, New York 17.

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CILIARY DILATION AND VITREOUS RECESSION IN CATARACT EXTRACTION

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After a review of the literature relative to the mechanism of accommodation and a limited amount of experimentation[1] on that subject, it appeared that some of this information might be useful in cataract surgery. During parasympathetic stimulation, the ciliary processes have been shown to move toward the lens and the anterior surface of the vitreous to bulge forward and axialward. There resulted a narrowing of the interval between the lens equator and the ciliary processes. Under the influence of parasympathetic depressants, the interval increased and the anterior vitreous moved posteriorly and centrifugally. It was apparent that parasympathetic depressants enhanced the possibility of a successful cataract extraction by their indirect influence on the vitreous and zonule.

In view of the reports of Cogan[2] and others, it was accepted that the sympathetic nervous system had a role in accommodation. It seemed logical that sympathetic stimulation should augment the effects of parasympathetic depression; that is, further widen the zone between the lens equator and the ciliary processes and produce added recession of the anterior vitreous.

Neosynephrine hydrochloride* (10 percent) and scopolamine hydrobromide (0.2 percent) were instilled in 80 eyes preceding cataract extraction. One hour before surgery two drops of scopolamine were instilled on the cornea; 30 minutes later two drops of 0.5-percent pontocaine hydrochloride were instilled, and this was followed in two minutes by the instillation of one drop of neosynephrine. In the operating room, two minutes after the first instillation of 5-percent cocaine hydrochloride, one drop of neosynephrine was again placed on the cornea. Approximately 15 minutes later, local anesthesia was completed and the operation was begun. An O'Brien akinesia and corneoscleral sutures were used in all cases. Six extracapsular extractions were done. The intracapsular method was attempted in the remainder but the lens capsule ruptured in six. In no case was vitreous lost. There was no tendency for the iris to bulge and in many cases its pupillary portion was recessed. The pressure required at the limbus to rupture the zonule was less than ordinarily needed. No patient complained of undesirable systemic reactions.

It is not amazing that there was no loss of vitreous in 80 consecutive cataract extractions, but in no case was vitreous protrusion threatened. The use of scopolamine and neosynephrine appeared to provide increased safety in cataract surgery. The drugs gave maximum pupillary dilation by relaxing the iris sphincter and stimulating the dilator. They widened the interval between the lens equator and the ciliary processes, thus increasing the tension of the suspensory fibers of the zonule. These changes facilitated the manipulation for zonular rupture. The anterior vitreous was actively recessed and a safeguard against its extrusion provided.

504 Medico-Dental Building (1).

*Neosynephrine hydrochloride solution (10 percent) supplied by Frederick Stearns and Company, Detroit, Michigan.

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SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

March 4, 1946

DR. MAURICE L. WIESELTHIER, *presiding*

CHARTING OF DIPLOPIA AND MUSCLE ACTION

DR. JOSEPH PASCAL discussed the subject during the preliminary instruction period (Published in this Journal, 1946, volume 29, August, page 1001).

THE OBSERVATION AND CORRELATION OF SCIENTIFIC DATA

DR. ERNEST L. SCOTT said that it is common knowledge that the items of a sample vary among themselves. It is also common knowledge that samples from a given population will differ from each other not only in the value of the mean but in the amount of variation within the sample.

Since one is usually interested in evaluating the population from which the sample is drawn as well as the sample itself, it is desirable not only to describe the sample adequately but to be able to describe the population and so to be in a position to predict the characteristics of further samples drawn from that population. The theory of sampling makes all of this possible.

The fundamental mathematics involved in the theory of sampling need bother one no more than does the formula for his microscope objective. The use of probability paper makes difficult drafting unnecessary. No more complicated apparatus than a ruling pen and a straight edge are needed to display the characteristics of a sample fully in a chart. Given the mean and standard deviation of an appropriate and adequate sample, one not only can describe that sample concisely but one also can predict the properties of further samples within stated limits, as well as the characteristics of the population from which the sample is taken. This implies the possibility of assigning a degree of probability that a single further item does or does not belong to the population; that is, whether the patient in the office is or is not normal with respect to the property being measured.

Since the description of a sample is mathematical, samples can be readily compared either by difference or by ratio, and the precision of the comparison can be stated. This makes for the convenience of the investigator in evaluating his data, and for the clarity and ease with which the report can be read. It also permits precise comparison of the work of different investigators who have reported their work in this form. The measures of variation will make conclusions more exact and will safeguard the reader against over-enthusiasm on the part of the author. Data treated systematically in this impersonal manner can hardly carry any tinge of bias.

If samples are to do all this satisfactorily, they must be both adequate and appropriate. Evidence is presented that when an appropriate sample approaches 50 items its statistics follow the requirements of the theory in a satisfactory manner.

The determination of appropriateness is more difficult. The sample must be homogeneous. The lack of homogeneity was illustrated in the early figures for CO_2 tension of the blood. The figures determined at sea level would not fit at high

altitudes. A method for homogenizing a sample was described.

Discussion. Dr. Percy L. Fridenberg said that Dr. Leo Burger observed symptoms in patients in the same age group (30 to 40 years), numbering over 100 cases, and tabulated them according to age, occupation, weight, and so forth. There was interference with the circulation of the lower extremities, and observation revealed thrombosis and obstruction of the blood vessels; that is, thrombo-angiitis obliterans. Ninety-five percent of these patients were tailors who sat with their legs crossed, smoked a great many cigarettes, and drank large quantities of tea. All of these symptoms can be considered as causative factors.

Systemic findings in retinitis pigmentosa

Dr. Isadore Givner and Dr. Maurice Bruger said that a study of 14 patients with retinitis pigmentosa gave the following results and conclusions:

1. No abnormalities in pulse rate, blood pressure, or temperature were observed.

2. The serum cholesterol was within normal limits in 7 of 11 patients in whom this determination was made. In three, it was only slightly elevated.

3. The basal-metabolism rate was within normal limits in 8 of 12 patients. In four, the rate varied from 15 to 21 percent below the average normal.

4. Each of 11 patients had creatinuria. This series included eight males and three females.

5. The spinal-fluid pressure was increased in 3 of 12 patients, but most of the other readings bordered on the upper limit of normal rather than on the lower levels. In 3 of 12 patients, the total protein content of the spinal fluid was definitely increased. In the remainder, normal values were observed.

6. Liver damage was not demonstrable in any of the 12 patients investigated.

7. The fasting vitamin-C content of the plasma was reduced in 7 of 9 patients in whom this determination was carried out. The two patients with normal findings had been taking cevitamic acid before the test was carried out. In seven patients, vitamin-A studies on the serum gave normal values.

8. In each of 11 cases, pupillography showed tonohaptic reactions and other evidences of diencephalic disorders.

9. Blood analysis for urea nitrogen retention and urine specific gravities after the administration of pitressin failed to reveal any measurable impairment in renal function in 13 patients.

10. Physical examinations including neurologic studies were essentially negative, except for the high incidence of high-arched palates and nerve deafness as revealed by audiometric tests. Seven of eight patients thus studied revealed impairment of hearing. Two patients were deaf mutes.

11. In two patients, microscopy failed to reveal any abnormalities in the capillaries of the finger bed.

Discussion. Dr. Otto Lowenstein found, in 1938, in collaboration with Franceschetti, the presence of tonohaptic pupillary reactions in retinitis pigmentosa and also in adiposogenital dystrophy, as well as in some chronic postencephalitic and catatonic conditions. Later, it was shown, experimentally and clinically, that tonohaptic pupillary reactions were due to lesions in the posterior (sympathetic) part of the hypothalamus and its connections to the midbrain, and that symptomatically they were due to a central weakness of the sympathetic. The significance became more evident in the light of experiments on the relations between endocrine glands and their autonomic control. When pituitary glands were im-

planted into pigeons or small mammals, or when antuitrin S was injected into human beings, increased parasympathetic activity resulted and could be shown pupillographically.

These facts, in combination with our knowledge of the melanophore-expanding hormones, may perhaps throw some light on the mechanism involved in the production of retinitis pigmentosa. Experimental work indicates the following schematic and tentative mechanism:

Inhibition of the sympathetic center, as indicated by tonohaptic pupillary reactions, causes a relative parasympathetic hyperactivity, stimulating pituitary action and resulting in, among others, the production of an increase of melanophore-expanding hormones. This increase in turn stimulates the parasympathetic centers in the interbrain. These parasympathetic centers in turn powerfully stimulate the pituitary to produce melanophore-expanding hormones, probably acting on the retina pigment and, independently, stimulating the interbrain, thus closing a vicious circle.

Dr. Von Sallmann asked: (1) How many patients of the series presented by Dr. Givner showed obesity and hypogenitalism in addition to other diencephalic pituitary signs? (2) Does Dr. Givner see any similarity between retinitis pigmentosa and the destruction of the retina induced by iodate? (In Dr. Salmann's opinion there is none—either in patients with iodide-iodate intoxication or in the experimentally produced lesion in rabbits.) (3) Does Dr. Lowenstein's theory on the mechanism in the diencephalic disturbance explain the cases of retinitis pigmentosa with intestinal spasm which are relieved by adrenalin? (4) Did the X-ray examination of the sella show an abnormality in Dr. Givner's series?

Dr. Givner said that Dr. Bruger's and his findings are not in disagreement with Dr. Lowenstein's theory of the pathogenesis of retinitis pigmentosa. Tendencies toward the lower limits in the basal-metabolism rate and toward low vitamin-C content are commonly found in vagotonia.

In answer to Dr. Von Sallmann, only their first case showed obesity and other clinical evidences of pituitary dysfunction. In regard to Kalt's experiment of injecting sodium iodate, they do not believe retinitis pigmentosa was produced, but a pigmentary disturbance of the retina was. Because Kalt felt that liver disturbance may be present in retinitis pigmentosa, they did the sensitive cephalin flocculation tests and found them negative.

In answer to the question regarding relief of intestinal spasm by adrenalin in cases of retinitis pigmentosa, the stimulation of the sympathetic might well counterbalance the vagotonia suggested by Dr. Lowenstein's theory. Finally, X-ray examination of the sella was not done routinely, but in those cases where it was, normal findings were encountered.

Ocular changes in rats on amino-acid (valine) deficient diet

Drs. Armando Ferraro and Leon Roizin described experiments in which young and adult rats (Sherman's stain) of the same sex (male), age, and litter were reared on a slightly modified valine-deficient diet as described by Rose.

The duration of the experiments lasted from 2½ to 4½ months. Five or six weeks after the experiments were started, the rats on valine-deficient diet developed, in addition to general changes and structural alterations of other organs which are still objects of microscopic studies, corneal changes leading to opacities. These seemed to be the results of edema, hyperplasia, and progressive degeneration of the epithelial cells leading gradually to keratinization and disorganization, most-

ly of the superficial layers of the interpalpebral cornea. In addition, pronounced vascularization was observed. Slight changes of the lens, characterized mostly by vacuolization of the cortex, were only occasionally noticed.

These structural changes of the eye appeared to be reversible in character, if treated in time, as demonstrated by the marked improvement following the administration of the synthetic valine to the animals on valine-deficient diet. This condition is being described as "nutritional corneal dystrophy" until further investigations are completed.

Discussion. Dr. Isadore Givner said that the amino-acid requirements for man may differ both qualitatively and quantitatively from those of the rat so that direct application to man of the results of experiments on animals cannot always be made.

Since there is, as yet, no suitable and reliable laboratory method for the detection of specific amino-acid deficiency, studies such as this are of importance. Eight of the 22 amino acids found in proteins have essential specific functions, yet they cannot be synthesized by the body. Hence, specific amino-acid deficiencies may occur, and it may fall to the ophthalmologist to detect early valine deficiency.

In general, proteins are important in the osmotic relation between intracellular and extracellular fluid. Although edema is not the earliest result of protein deficiency, it is, in our present state of knowledge, about the first clinical sign of deficiency. It is not surprising that the first change observed in the cornea in valine deficiency is edema of the corneal epithelium. Interestingly enough, the edema is usually confined to the interpalpebral area. In one case, however, a bullous keratitis developed in the center of the cornea, while edema of much less degree was found over the remainder of the cornea. Following this change as the deficiency progressed, the most superficial layer became keratinized and in one instance showed stippling after fluorescein was instilled and irrigated out. The edematous process is reversible.

The vascularization is very interesting in that it is all deep, starting as an arcade at the periphery and then becoming extended into the deep stroma. This is in marked contrast to tryptophan deficiency in which the vascularization is superficial. Under treatment, the lumen becomes reduced in width and becomes bloodless. The changes in the lens are minimal. In some of the cases studied, no opacities were found; in others, they were found only in the anterior portion of the cortex and were not sufficient to obstruct ophthalmoscopic study. The remainder of the eye was normal. This was verified on histologic study.

Hydrogen-ion concentration of the aqueous

Dr. Ludwig Von Sallmann used two glass electrodes, especially designed for measuring the pH of the intraocular fluids in vivo. For determination of the hydrogen-ion concentration in the aqueous, the electrode consisted of a micropapillary and was armed with a fine needle which was inserted into the anterior chamber. The pH of the vitreous was determined with a membrane electrode. Great care was taken to avoid erroneous readings due to the uncontrolled escape of carbon dioxide and due to inaccuracies in temperature control. It was found that the anatomic conditions of the eye were extremely well-suited for this type of in vivo procedure. The physiologic pH of the aqueous fluid in rabbits ranged between 7.44 and 7.49 at the early phase of general anesthesia with a barbiturate. Local anesthesia and pro-

longed general anesthesia altered the pH of the aqueous inversely; that is, local anesthesia caused a shift to the alkaline side, and general to the acid side. Diets rich in alkali and the introduction of anions into the aqueous by ion transfer did not cause significant changes. A definite but moderate shift to the acid side occurred in the aqueous when the vitreous was the site of a bacterial infection. The use of the electrodes and the technique designed for the determination of the pH in vivo gave information unobtainable with other procedures on the hydrogen-ion concentration of the aqueous and vitreous in physiologic and pathologic conditions.

Influence of sympathomimetic drugs on the regenerative processes of the ocular epithelia

George K. Smelser, Ph.D., studied the effect of topical applications of a number of sympathomimetic drugs on mitosis in the corneal epithelium of 87 animals to determine if they were similar in their action on this process. Epinephrine, neosynephrine, ephedrine, benzedrine, and privine were used in addition to pitressin, which was included because of its action as a vasoconstrictor. Four of these compounds, applied topically to the eyes of rats at hourly intervals, caused a marked decrease in cell division in corneal epithelium. Pitressin and privine lacked this effect, although they caused a prolonged blanching of the conjunctiva.

No mitotic inhibition was noted in the conjunctival epithelium of the epinephrine-, benzedrine-, and neosynephrine-treated animals in which a marked depression of mitosis in the corneal epithelium was demonstrated. Privine and pitressin were without effect on mitosis in the conjunctiva but ephedrine (0.5 percent) inhibited cell division significantly in two thirds of the animals.

These drugs were also applied topically at two-hour intervals to standard thermal burns of the cornea in order to determine their effect on regeneration of the corneal epithelium. All of the compounds caused some delay in healing, but this was very slight in the case of epinephrine (1:2500) and pitressin. The only extreme delay in healing was caused by privine, an unfortunate paradox, in view of the entire absence of harmful effect of this drug on mitosis in the intact cornea.

Leon H. Ehrlich,
Recording Secretary.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 12, 1946

Dr. T. S. Leatherwood, *presiding*

Metastatic endophthalmitis

Dr. P. M. Lewis and Dr. G. M. Wallace reported the case of M. C., a 17-months-old colored girl, who was seen on the Ophthalmological Service of the John Gaston Hospital on January 28, 1946.

The anamnesis as given by the mother was that for a week or 10 days prior to the onset of the present illness the child had been receiving injections for relief of painful joints. The nature of the medication was not learned. Forty-eight hours before admission, her left eye became red and the lids seemed to close slightly. No other pertinent information was elicited; however, the hospital records revealed that the child had a nonspecific vaginitis at the time of birth.

Examination revealed the girl to be normal except for the left eye. The lids of this eye were normal in structure but partly closed; the conjunctiva and episcleral tissues were highly and diffusely inflamed; the iris and lens could not be

identified as such; the tension was normal, as were the extraocular movements.

Treatment instituted upon admission consisted of the administration of 10,000 Ox.u. of penicillin every 3 hours; 5 gr. sodium salicylate, 4 times daily; warm boric-acid compresses for 15 minutes, 4 times daily. Atropine-sulfate ointment (1 percent) was applied once daily. In 24 hours, the condition had so changed that the periphery of the iris could be seen. At this time it was felt a metastatic endophthalmitis was present. The following laboratory tests were made, and the results revealed the urine to be normal; red blood corpuscles to be 3,780,000 per c.c.; white blood corpuscles to be 11,950 per c.c.; a blood culture to be negative on the fifth day of incubation; a smear from the vagina to have no pathogenes. X-ray studies of the chest reported a right sided broncho-pneumonia. Consultation with other departments did not reveal any obvious foci of infection.

Six or seven days after admission the hypopyon cleared entirely, and two narrow, posterior synechiae were present at the 12-o'clock position. Later these synechiae disappeared. The pupil became widely dilated, and the lens appeared to be uninvolved; however, it was then possible to see a white, dense mass filling the vitreous body immediately behind the lens. The eye lost the greater part of its angry appearance as well as some of its normal ocular tension, but it did not become exceedingly soft.

The patient did not appear to be acutely or seriously ill. Her appetite was fair. Her temperature was elevated only during the first five days of hospitalization, during which time it did not exceed 101° F. She was seen last on February 13th, three days after discharge from the hospital, at which time her condition was slowly improving. Because of the extreme youth of the patient, it was not possible to determine the degree of vision present in the eye.

Traumatic occlusion of the central retinal artery

Dr. P. M. Lewis and Dr. G. M. Wallace presented the case of R. F., an 11-year-old colored boy who was seen on the Ophthalmological Service of the John Gaston Hospital on March 4, 1946.

The history revealed that 24 hours before admission to the hospital the boy had accidentally fallen upon a stick, and the force of the fall had been sustained by the left orbit and its contents. A very small quantity of blood escaped the wound; pain was severe momentarily but subsided in a short time; amaurosis developed immediately and persisted in the left eye. Other information was not pertinent to the present illness

With the exception of the findings in the left eye and orbit, the physical examination revealed a healthy child. The anatomy and functions of the right eye were normal. The palpebra of the left eye were moderately swollen. Superficial abrasions, present at the junction of the mesial and middle thirds, were directed vertically in their greatest length. There was minimal ecchymosis of the lids. The extraocular movements were normal in all directions except temporally. Limitation in this direction was accompanied by pain. The tension of the left eye did not feel abnormal to palpation. A subconjunctival hemorrhage measuring 6 to 7 mm. in diameter was present over the area of the tendon of the lateral rectus muscle. The cornea glistened normally and did not show any abnormalities. The anterior chamber and aqueous were also found to be normal. The pupil was moderately dilated. It did not respond to light and dilated widely when 4-percent cocaine and 1:1000 adrenalin-chloride solutions were instilled. The pupillary response was

not determined with the use of miotics. No structural abnormalities of the iris could be detected; however, the patient was not subjected to slitlamp examination. Although the vitreous and retina contained numerous dense hemorrhages, there was nothing unusual about the lens. The hemorrhages in the vitreous were quite dense and well-defined, and they appeared to be limited by some organic structure or membrane which prevented their diffusion throughout the entire vitreous body. The masses of blood could be seen to be slowly gravitating in mass toward the dependent positions after agitation; one large, dense mass was localized immediately anterior to the papilla and precluded visualization of that structure. The retinal hemorrhages were irregular in size, shape, density, and location. The retina throughout most of its extent was quite white and edematous; however, the inferior nasal quadrant in the area of the equator of the globe had an almost normal coloration. Immediately adjacent and inferiorly to this there was evidence of a retinal separation. Observation at first showed the veins to be full and the arterioles absent of blood except in a few sites where the "cattle-truck" effect was present. Forty-eight hours later fundal examination revealed the veins in certain areas to be entirely absent of blood, the "cattle-truck" effect also present in the veins, and the arterioles unchanged in appearance. The expected macular abnormality was present.

Routine-laboratory urine and blood findings were normal; light perception remained absent; the intraocular pressure variation was not pathologic; and the patient was discharged without treatment from the hospital on March 7, 1946, and sent to the out-patient ophthalmological service to be followed for further observation.

Cyst of the iris

Dr. Philip Meriwether Lewis presented a patient on whom he had recently operated for a large iris cyst. The patient, a white man aged 26 years, had had his left eye injured, in 1938, by a piece of steel which was removed by operation. The vision was almost entirely lost by this accident. The patient was first seen at the Eye Clinic of the University of Tennessee in January, 1945. He was having severe pain in the left eye which was highly inflamed, with a steamy cornea and tension of 50 mm. Hg (Schiøtz). A grayish mass filled a large portion of the anterior chamber. Vision was perception of light only. The patient was admitted to the John Gaston Hospital for treatment and probable enucleation. When the cornea cleared slightly, it could be seen that the gray mass was a large cyst of the iris and that the lens was completely opaque.

Removal of the cyst was attempted, but was only partly successful. The cataract was removed in its capsule. Following this the eye did well for several weeks, but the cyst reformed and grew rapidly, extending from the 4- to the 6-o'clock positions and upwards above the center of the cornea. On March 9, 1945, a keratome incision was made just above the temporal border of the cyst. The incision was enlarged with scissors downwards to the 7-o'clock position. The cyst was removed with forceps and scissors. The eye has been comfortable since operation. Uncorrected vision was the counting of fingers at about three feet.

Diathermy treatment in retinal angiomatosis

Dr. Philip Meriwether Lewis presented Mrs. M. P., aged 34 years, a white woman, upon whom he had operated for angioma of the retina.

The patient was first seen in July, 1944, while she was confined to the John Gaston Hospital for general medical studies to find the cause of severe headaches. The angioma was found when the fundi were examined for possible papilledema. Complete general physical and laboratory examinations were negative and the consulting neurosurgeon felt that there was no evidence of cerebellar involvement. The right eye was normal. The disc of the left eye was slightly blurry. Below the disc, two very large blood vessels coursed tortuously downward and forward to a tumor mass in the 6-o'clock median, between the equator and the ora serrata. The tumor mass was about 1½ times the size of the optic disc and of a light, reddish-brown color. The retina surrounding the tumor mass was not detached. Vision was: O.D., 20/20; O.S., 20/100. There was a large contraction in the superior visual field corresponding to the angioma.

Destruction of the angioma with diathermy, using the Walker pins, was done on September 6, 1944, at the Memphis Eye and Ear Hospital. Essentially the same technique as that described in a previous case report* was used. A large retinal detachment developed, probably due to holes made in the retina with the pins. The detachment gradually became worse; so on September 26, 1944, an operation was performed with the hope of reattaching the separated retina. Following this, the vitreous was hazy for a long time which prevented a clear view of the fundus.

The patient was sent home about four weeks later with pin-hole spectacles. Iodides, internally, and the passage of time gradually cleared the vitreous so that the fundus could be clearly seen. When last examined, February 18, 1946, her vision was 20/30 and J2. Extensive scarring and pigmentation covered both the site of the angioma and a considerable area. The retina was completely reattached. Except for a very small central canal containing blood, the large artery was converted into fibrous tissue. The vein was much reduced in size but was still considerably larger than normal. There was no evidence of a recurrence of the angioma.

* Published in the *Archives of Ophthalmology*, 1943, volume 30, August, page 250.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

March 21, 1946

Dr. Burton Chance, *chairman*

Vascular disease associated with angioid streaks of the retina and pseudoxanthoma elasticum

Dr. Harold Scheie and Dr. Norman E. Freeman presented three patients having angioid streaks of the retina, two of whom showed marked disturbances of peripheral circulation. These two patients also had skin changes of pseudoxanthoma elasticum. The third patient had no skin changes, but did have essential hypertension. In view of the vascular changes in the other two patients, it was thought that the hypertension showed by the third patient could have been due to similar changes in his renal arteries.

The other two patients showed diminution or absence of peripheral pulses determined by oscillometer readings. Occlusion of one or more peripheral arteries was seen in both patients. The femoral arteries of both patients were calcified and could be visualized by X-ray. Biopsy of the skin and ulnar artery of one patient revealed the classical changes of pseudo-

xanthoma elasticum in the skin and unusual changes in the arteries. The elastic tissue within the arterial wall was fragmented and broken up. The lumen was occluded or nearly occluded by marked hyperplasia of the muscularis, possibly as a result of loss of elastic tissue support.

Suggestion was made that physicians having patients with the angioid streaks of the retina of pseudoxanthoma elasticum should review them from the point of view of vascular disease. Since either of these two conditions can occur as the predominant feature of this generalized elastic-tissue disease, the disturbance in the blood vessels might, in some cases, be the only or most marked manifestation. This should be kept in mind, and ophthalmoscopic examinations should be carried out in all obscure disturbances of peripheral circulation, for the condition greatly resembles Buerger's disease.

Discussion. Dr. Francis Heed Adler said that the thesis of this communication was well-founded; that is, that angioid streaks of the retina, Paget's disease, pseudoxanthoma elasticum, and some forms of peripheral vascular disease are parts of the same clinical entity, which is not as yet completely elucidated.

The pathology of the arteries is not entirely clear, as was evidenced by the fact that a number of pathologists to whom these sections were shown were somewhat puzzled by them. However, the general consensus of opinion seemed to be that they were dealing with a disease process confined to the elastic tissue of the arteries. Although it has been mentioned in the literature that such changes might be present, it seems strange that no-one, until now, has made a study of the elastic-tissue changes in the arteries in these cases.

These findings tend to confirm the opinion that the pathologic condition underlying angioid streaks in the retina is a degeneration of the elastic tissue of Bruch's membrane.

Dr. Adler concluded by saying that he was grateful for the opportunity to hear this interesting and beautifully presented work.

Dr. George F. J. Kelly asked Dr. Scheie whether he had had much to do with getting this section of artery. After all, this artery was a little patulous. When this piece was removed, was the collateral circulation sufficient to carry on? One can obtain sections of skin and of similar tissues, but obtaining a section of an artery is a bit unusual.

Dr. Frank B. Walsh said that it was interesting that pseudoxanthoma elasticum was associated with angioid streaks in all the cases described. How frequently had the essayist seen angioid streaks in the absence of changes in the skin?

Dr. Harold Schie (closing) in replying to Dr. Kelly, said that the biopsy was taken with very little hesitation because the ulnar artery was completely occluded. Microscopic evidence further justified taking the biopsy by verifying the occlusion. The wall of the artery and the tissues surrounding the artery showed newly formed and anastomotic vessels as large as the very minute residual lumen of the ulnar artery. The presence of a residual lumen was even debatable. If the artery was examined several sections higher, what seemed to be residual lumen at the lower level had shifted to one side and looked like any of the anastomotic vessels. The patient was an intelligent soldier who understood the situation when it was explained to him. He was told that he would derive no benefit from the procedure, but that, if further information could be obtained, it might possibly aid others in the future.

In answer to Dr. Adler's question: Clinical disease of the peripheral vessels has not been mentioned in the literature.

Sholz did mention absence of peripheral pulses in one patient, but apparently he considered it no further. Several references to histologic elastic-tissue degeneration in vessel walls were found as part of routine microscopic studies.

A COMPARISON OF THE OCULAR SIGNS IN CHILDREN AND ADULTS SUFFERING FROM SUBDURAL HEMATOMA

DR. FRANK B. WALSH, Baltimore (by invitation), spoke on this subject. His study was based on case records of 36 infants and 54 adults. He said that the condition occurs almost exclusively in infants or children less that two years of age and in adults over 20 years of age. Trauma is unquestionably the etiologic factor in adults. There is bulging of the fontanel in a majority of infants. Both in infants and in adults there may be absence of neurologic signs but irritability and drowsiness are commonly present. The hematoma is usually unilateral in adults and bilateral in children. The spinal fluid in infants usually contains blood or is xanthochromic; whereas, in adults it almost invariably is normal.

The ocular signs. In adult patients we have not found the incidence of papilledema as high as other observers (Dandy, King, Furlow). Retinal hemorrhage was frequently present in infants, but not in adults. Both in infants and in adults dilatation of the pupil may occur. In adults such dilatation usually is on the side of the hematoma. The sign is not as important in infants, because usually in them the lesion is bilateral. Ptosis was observed contralateral to the lesion in six of our cases. Such ptosis may be supranuclear in origin, but it may be evidence that there are multiple lesions. Conjugate deviation of the eyes away from the side of the hematoma probably is due to a lesion in the hemisphere opposite the hematoma.

Pathogenesis. A point of difference between the infant and adult brain may be important as regards differences in symptomatology in these two groups. In the infant unsupported veins enter the superior longitudinal sinus. In the adult pacchionian granulations serve to bind together the dura, arachnoid, and longitudinal sinus.

Discussion. Dr. J. Parsons Schaeffer said that he would like to know how many of the subdural hematomas in the earlier ages were the result of birth injuries. He also asked a question about the variation in the size of the optic foramen through which the optic nerve passes into the orbit. When the size is roomy, it might be inferred that the subdural hemorrhage would readily pass into the dural-arachnoid interspace; when blood does not so pass, it might be considered as due to the bony encroachment on the optic nerve and its sheaths and interspaces.

Dr. Francis Heed Adler said that the high incidence of subdural hematomas in infants could be logically explained by the prevalence of birth injuries. Every normal birth exposes the child to cranial compression. When one considers that the fontanels are open at birth and for some time after birth, it is no wonder that there should be a high incidence of intracranial trauma. From the time the fontanels close, the child is not often exposed to any serious intracranial damage until he reaches the age at which serious accidents are apt to occur. In other words, the falls and bumps of the nursery do not produce intracranial pathologic conditions, but industrial accidents often do. It would seem to be much more logical to assume that this was the explanation of the distribution of subdural hematomas according to age, rather than to base an explanation on an anatomical difference between the cranial contents of the infant and the adult.

Dr. Adler said that Dr. Walsh had asked him to comment on ptosis as a sign of supranuclear paralysis. Since the lid muscles have a separate representation in the frontal cortex, it is possible to have a supranuclear paralysis by a lesion situated anywhere from the cortex on down to the nucleus. This, of course, is not true of the individual muscles controlling the movements of the eyeball. Further than this, the fiber tracts for the levator and orbicularis (this latter is questionable) run together with the fiber tracts for upward and downward movements of the eyeballs in the region of the corpora quadrigemina. Accordingly, lesions in this neighborhood cause disturbances of upward and downward movements of the eyes, together with ptosis and tucked lids. A few years ago, Collier called attention to ptosis and lid retraction as signs of supranuclear paralysis of the third nerve; thereby differentiating these lesions from those affecting the third nerve, itself, or the nucleus. If the lesion be anterior, lid retraction is apt to be present; whereas, if the lesion be posterior, ptosis occurs.

Dr. Walter I. Lillie said that Dr. Walsh was to be congratulated on his presentation of a very difficult subject, since the classification of traumatic cerebral changes is not always too well-differentiated. Clinically, it is often difficult to correlate the multiple bizarre changes with a single lesion. Although a single large lesion is present, associated small multiple lesions help to explain the syndrome. Dr. Lillie said that Dr. Walsh had not specifically explained why a subhyaloid hemorrhage occurs in infants and not in adults. The occurrence of subhyaloid hemorrhages in adults is usually associated with a compression injury to the chest or the neck, but it is possible that it may occur from intracranial venous compression.

The diagnosis of subdural hematoma is usually supported by an encephalogram, as the variations in the fluid channels reveal the space-taking lesion.

The occurrence of general convulsions in adults should suggest a frontal, temporal, or occipital-lobe lesion. In such cases, a routine perimetric-field examination should be instituted. Many times a quadrantal homonymous hemianopsia has been found a year or two in advance of other definite signs of a space-taking lesion.

Dr. Henry A. Shenkin said that he would like to add a few remarks from the neurosurgeon's point of view. Dr. Walsh made an effort to distinguish between subdural hematoma in the child and in the adult, and it is true they are quite different. The fact that there are open fontanels in the infant would well account for the difference in symptomatology.

Papilledema does occur in adults but it has been Dr. Shenkin's experience that it rarely is seen in infants. The fact that the fontanels are open could permit sufficient expansion of the calvarium to absorb the pressure. The presence of convulsions in childhood may well be due to a lowered convulsive threshold, said to be characteristic of infancy. However, the length of time to which the cortex is subjected to irritation may be the convulsive factor. It is known that brain tumors of slow growth are the ones most frequently associated with seizures; subdural hematoma of long duration may be more frequently associated with seizures. The open fontanels, compensating for the increased mass of the hematoma, permit the child to survive for periods far in excess of the usual time in which the life of an adult would be threatened by a chronic subdural hematoma. It is likely that the subdural hematoma of infancy is caused by birth trauma. The appearance of the lesion, and the history of the child's development substantiate this. Physicians are

usually consulted when the child is 6 to 12 months of age. In the case of adults life-threatening symptoms from chronic subdural hematoma usually develop in 6 to 12 weeks after their injury.

Unilateral dilatation of the pupil is more characteristic of acute subdural hematoma than of the chronic form. Dr. Shenkin said that he believed subdural hematoma of infancy to be more analogous to the latter entity than to the former. Indeed, ipsilateral dilatation of the pupil is far more characteristic of the fulminating syndrome of acute epidural hemorrhage than of the more slowly developing acute subdural hemorrhage.

He agreed that the results of treatment of subdural hematoma of infancy are poor. This could be explained by the delay in making a proper diagnosis. The growing brain is compressed for undue periods of time, and often it never recovers sufficiently to develop to its full capacity.

Dr. J. Parsons Schaeffer said that he would like to bring out these two points. First, there is some thought that the facial nerve may, in some manner, cause the peculiar behavior of the upper eyelid in certain cases. Some of the fibers that arise from the nucleus of the oculomotor nerve descend in the medial longitudinal fasciculus and either terminate about the cells of the nucleus of the facial nerve or join the facial nerve as such, passing in the facial nerve to the upper part of the orbicularis oculi muscle; thus, associating the innervation of the levator palpebrae with that of the orbicularis oculi. Although it is generally accepted that the oculomotor supplies the levator palpebrae and the orbicularis oculi is supplied by the facial, this intermingling of the fibers of the two nerves may well be variable enough to account for such peculiar manifestations with reference to the action of the upper eyelid. Much more study needs to be done.

The second point concerns the new-born infant to which the speaker referred. There is no doubt that the veins, as they course to enter the superior-sagittal sinus, are fairly free. It is, however, equally true that the mesothelium covering them does not add much protection. Later, in the adult, as the brain membranes become more pronounced and the interspaces are developed, the parts become matted together near the superior-sagittal sinus. Also, the arachnoid and the subarachnoid spaces in the form of arachnoidal granulations are protruded into the superior-sagittal venous sinus; the endothelium, of course, is crowded ahead. This adds further to the crowding near the venous sinus and to the encroachment upon the cerebral veins as they enter the dural sinus.

Dr. Frank B. Walsh (closing) replied to Dr. Schaeffer by saying that, in some infants, birth injury was a possible explanation for subdural hematoma but that it was extremely doubtful if this was so in a majority of infantile cases presented. They have not made studies on the optic foramina.

Dr. Adler's explanation of supranuclear ptosis involving the lid opposite the hematoma is interesting. However, there is no characteristic feature in such a ptosis that would eliminate the possibility of it having been produced by a homolateral, uncompleted, third-nerve palsy. It is well that attention was drawn to Collier's paper, which is excellent.

Dr. Walsh agreed with Dr. Lillie that there may be multiple lesions in these cases. He was unable to explain the preretinal hemorrhages seen in cases of subarachnoid hemorrhage. It is thought such retinal hemorrhages are venous in origin. One would think they might be associated with sudden increase in intracranial pressure. However, Gardner has shown that the intracranial pressure in many cases is not increased.

George F. J. Kelly,
Clerk.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

January 15, 1946

DR. THEODORE L. TERRY, *presiding*

A METHOD OF ENTOPTIC SCOTOMETRY

DR. JOSEPH L. LO-PRESTI read an interesting paper on the above subject. Dr. Lo-Presti said that the minute, constantly moving entoptic particles best seen through blue or red-blue filters may be used as test objects in central scotometry. These have been called red or white blood corpuscles but the more noncommittal term "motes" is proposed because of their small size and motion. These two features, together with their presence throughout the entire field all at the same time, make them ideal test objects. An apparatus was devised to measure and record those areas where they are absent, scotomas. This consists of a brilliant source of illumination; a 10 diopter, wide lens to achieve Maxwellian illumination in the eye; an iris diaphragm with cross hairs; a well to hold, at a distance of 190 mm. from the eye, cleared X-ray film on which scotomas are outlined by means of a soft crayon; a water cell containing a solution of saturated copper sulfate and basic fuchsin transmitting wave lengths of 350 to 470 and 550 to 620μ; and a chin rest.

A small, central area free of motes, the blood-free area of the fovea, is present in all normal fields. In 10 normal subjects this was found to measure from 1.2 to 2.4 mm. and was identical for both eyes. These figures agree with the average reported by Sperling, Miller, and Adler in 78 normal eyes, 1.5 mm.

To rule out extraocular factors, 10 cardiacs, 3 anemics, and 2 leukemics were studied and found to have normal-size, mote-free areas. If increasing pressure is brought to bear on the eye examined, the motes first slow down and finally stop. Using a Baillart ophthalmodynamometer, pressure readings of 80 to 120 gm. had to be exerted before the motes stopped moving in 25 normal subjects. For the 15 subjects with cardiovascular disease and blood dyscrasias, pressure readings were found within this range.

A total of 65 cases, divided into three groups, was reported: (1) those showing close correspondence with results employing the Evans method of campimetry (30 percent); (2) those showing fair correspondence (50 percent); (3) those showing poor to no correspondence (20 percent). These groups included cases of old chorioretinitis, retinitis pigmentosa, occlusion of branch of retinal artery, traumatic hole of macula, multiple sclerosis, tobacco amblyopia, juvenile and senile macular degeneration, diabetic chorioretinopathy, retinal separation, and quinine amblyopia.

Dr. Lo-Presti stated that in all cases of active disease of the posterior segment of the chorioretina a markedly reduced pressure reading was shown to obliterate motion of the motes.

EFFICIENCY OF CYCLOPLEGICS

DR. S. JUDD BEACH made some remarks regarding the efficiency of cycloplegics, in the absence of Dr. Alexander E. MacDonald who was to have been guest speaker of the evening and who was to have read a paper on "War-time Research in Ophthalmology." Dr. Beach said one factor in the contradictory pronouncements regarding the efficiency of cycloplegics is the variation in the response of different individuals rather than the different types of drugs used. Another is the unreliability of the tests for depth of cycloplegia. Three common tests are:

1. Nearpoint test, made by placing usually a +3.00D. sph. before the eye

corrected for distance. Type should then focus at 13 inches. The advantage of this method is that residual accommodation is stimulated by approaching type to eye but measurements are increasingly subject to error the nearer the type approaches the eye, and vary with the personal equation.

2. Placing test type at focal point of convex lens. Then estimate residual accommodation by noting the highest concave lens which can be overcome.

3. By retinoscopy.

Dr. Beach said further that there seemed to be no sound reason for the popular method of cycloplegia which employs atropine three times a day for three days in children; homatropine five times in an hour for young adults or scopolamine twice in an hour at any age. In general, this method does not increase the depth of cycloplegia beyond that resulting from single instillations of the same drug. Resistance to the drugs varies with individual idiosyncrasy rather than method of administration. It may even differ in the two eyes of the same person.

According to Dr. Beach, three sorts of response can be identified:

1. Complete relaxation both for near and distant vision.

2. Complete relaxation for distant vision with residual accommodation active at near.

3. Accommodation in evidence both for near and distant vision. This occurs in about 10 percent of all cases. Contrary to common belief, resistance to cycloplegia is not a property of younger ages, nor of higher astigmatic errors.

In closing, Dr. Beach said that dibotuline, a nonmydriatic cyclopegic, seems about as effective for distant vision as homatropine. Cycloplegia gives valuable information but is not as reliable as is generally believed. Mahlon T. Easton,

Recorder.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

February 19, 1946

Dr. Howard F. Hill, *presiding*

Experience in operations on the superior and inferior oblique

Dr. Conrad Berens read an interesting paper on the above subject. Dr. Berens observed that during the past 20 years he has performed an increasing number of operations on the vertical acting muscles, especially on the inferior obliques. In his study of results following surgery, it became apparent to him that failure to obtain good binocular vision or functional results was caused most commonly by hyperphoria or hypertropia. He pointed out the importance of carefully observing the anatomic relationship of the attachment of the inferior oblique to the globe. In freeing the muscle from its attachment, one must be careful not to injure the optic nerve; and when re-attaching the inferior oblique, care must be taken not to puncture the inferior vortex vein. He also stressed the importance of the suspensory ligament of Lockwood and the condensation of Tenon's capsule forming the ligament between the inferior oblique and the inferior rectus muscle.

The following indications for retroplacement of the inferior oblique were outlined:

1. Moderate degree of monolateral or bilateral hypermetropia or hyperphoria caused by a paresis or paralysis of the contralateral superior rectus, with or without marked spasm of the inferior oblique.

2. Esotropia complicated by spasm of the inferior oblique, causing an upshoot of the eye as it is adducted.

3. Paresis of the superior oblique and secondary spasm of the inferior oblique of the same eye.

4. Fibrosis of the lateral rectus muscle with secondary spasm of the inferior oblique of the same eye. The average effect on 97 patients for a 1 mm. retroplacement of the inferior oblique was at 6 m., 0.9$^{\Delta}$; at 25 cm., 0.9$^{\Delta}$ in the primary position. In the field of action of the inferior oblique at 25 cm., the effect was 2$^{\Delta}$. The average effect obtained by myotomy of the inferior oblique at the orbital margin was in the primary position at 6 m., 5.3$^{\Delta}$; at 25 cm., 7.7$^{\Delta}$; and in the field of action of the inferior oblique at 25 cm., 11$^{\Delta}$.

The indications for advancement of the inferior oblique at the orbital attachment were suggested as: (1) Hypertropia associated with homolateral pseudoptosis, the result of the depressed position of the eyeball when caused by paresis of the inferior oblique. (2) Postoperative paresis of the inferior oblique, especially when cyclotropia prevents fusion. (3) Paresis of the inferior oblique associated with lateral deviations. (4) May be combined with an advancement of the superior rectus.

Dr. Berens also suggested transplantation of the superior oblique for complete third-nerve paralysis. He first corrected the heterotropia and then, if binocular function was adequate or diplopia could be disregarded, he corrected the ptosis.

In conclusion, Dr. Berens again emphasized that he had found a careful study of the oblique muscles and correction of their anomalies by surgical intervention to be one of the most important factors in obtaining good functional results in the surgery of the ocular muscles. Because the importance of the obliques has become increasingly apparent in the department of motor anomalies of the New York Eye and Ear Infirmary, he now has records of more than 700 operations which have been performed on the inferior obliques.

Some experimental and clinical observations concerning stereopsis

Dr. Herman M. Burian read an interesting paper on the above subject. Dr. Burian said that stereopsis is a perception sui generis. It is not simply one aspect of even the highest refinement of single binocular vision. It is to some extent independent of single binocular vision, since it can be shown to exist in diplopia, where there is simultaneous binocular perception but not single binocular vision. On the other hand, stereoscopic perception may be electively suppressed. This means that single binocular vision exists only for identical images, while the disparate elements of stereoscopic pictures are suppressed. This elective suppression may be regional and limited to the central retinal area. Although stereoscopic sensitivity in normal individuals is, to some extent, a function of visual acuity in that it decreases from the center to the periphery of the retina in the same ratio as does the visual acuity, a certain independence is again shown by the function of stereopsis. Patients who suppress centrally the stereoscopic elements may have perfectly normal visual acuity; while others who have an amblyopic eye may show a surprisingly high degree of stereoscopic sensitivity.

Dr. Burian concluded by saying that this was not the time to go into the theoretical implications of the facts he had mentioned but that he believed it safe to say that stereopis is a physiologic process; that is, stereopsis is the result of stimulation of specific central nervous arrangements by specific stimulus patterns. It is not a psychologic process, as is the fashionable belief in some circles.

Mahlon T. Easton,
Reporter.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

ADVANCES IN THE CARE OF MUSCLE ANOMALIES

On a recent trip to the Middle West, discussion with a colleague brought out the comment that there was still much to be desired in the results obtained from muscle surgery. It must be admitted that at times our results are very disappointing even after detailed preoperative study.

However, a review of the change that has taken place in the care of muscle anomalies during the last 25 years shows that, while there is still much to be learned, great advance has been made during that time.

I have recently had the occasion to go over some records of squints operated upon by my late chief 30 to 35 years ago. The "muscle workup," as measured by our present standards, was very incomplete. The child was refracted to determine the amount of the refractive error and its possible relation to the squint. The amount of squint was measured on the perimeter

and gross tests were made for the presence of ocular palsies. No prism measurements were made and very little attention was given to the difference in prism diopters, between the degree of squint for distance and near. The obliques were "holy ground" and received very little attention, the edict being that they should be left alone.

The surgery consisted of an advancement or resection of one muscle and a complete tenotomy of the opponent. The operator took pride in being able to correct the squint in one operation, irrespective of the amount, and looked upon the surgery as a failure if this was not accomplished. The effort was to obtain an immediate "cosmetically good" result. The fact that convergence might be absent or that there might be limitation of the tenotomized muscle was no deterrent. No attempt was made to give the child preoperative training in the hopes of preparing the ground for the establishment of binocular vision. Postoperatively, attempts were made to establish some form of fusion by the use of the stereoscope. Very little effort was made to improve the vision of the amblyopic squinting eye. As late as 1928, Ernst Fuchs* in discussing the amblyopic squinting eye states: "The most important argument has been over the improvement of the vision of the amblyopic eye by its use. Attempts have been made to do this by prolonged occlusion of the nonsquinting eye. The prolonged occlusion of the well eye is not practical, and the daily occlusion of the eye for an hour is useless. For this reason I long ago discarded this procedure which is still used rather extensively."

This, then, was the attitude of the average well-trained ophthalmologist of the last generation, particularly the European-trained man.

However, in that same generation such men as Duane, Jackson, Worth, and others were doing original work on extraocular muscles which was to lay the foundation for our more modern conception. More recently this was advanced by the work of Peter, Bielschowsky, and White. A comparison of the muscle training available to our residents and that obtainable 25 to 30 years ago brings out in a rather startling manner the advances made in the interim.

Today the final goal is the establishment of third-degree fusion in every case of squint, and while this is not possible in every instance, the percentage of successful cases is much higher than that obtained by the older methods. The proper preoperative use of occlusion of the nonsquinting eye, with improvement of vision in the amblyopic eye in a large percentage of the cases; the careful measurement in prism diopters of the amount of deviation in the six cardinal directions of the gaze; the preoperative use of orthoptics: all these aid in the determination of the surgical procedure indicated.

This information also makes it possible to determine in most instances whether or not fusion will be possible. Orthoptics, intelligently used, will at times indicate that it is best not to use orthoptics and occlusion, since the result would be a troublesome diplopia.

A rather significant indication of the advancement made in the care of muscle anomalies in recent years is the new attitude toward the oblique muscles. Much has been done to improve our knowledge of the action and physiology of these muscles. The methods of diagnosis of the anomalies of the obliques have also been improved. While there is at times still a good deal of debate as to whether or not the overaction of a given oblique muscle

* Fuchs, Ernst. Aus Meiner Augenärtzlichen Praxis; Festschrift der Königel. Universitäts-Augenklinik In Zagreb, Jugoslawien, Zagreb, 1928.

is primary or secondary, the fact remains that these muscles are better understood than they were 25 years ago.

The operative procedures used in the correction of squint, in recent years, have been designed to correct the deviation safely, and to make possible the normal physiologic action of the muscles. This is borne out by the newer procedures that have been presented for the correction of anomalies of the obliques. The detailed postoperative care received by these cases is also instrumental in evaluating the newer procedures. Thus, for example, evidence is beginning to accumulate which would indicate that recession of the inferior oblique at its insertion may be a better procedure than the tenotomy of the inferior oblique which has been used. The new operations that have been presented in the last few years for anomalies involving the superior oblique further show the advancement that is being made.

It is true that there are still many debatable points regarding squint surgery, but the amount of work that is being done in this field is constantly changing our conceptions of muscle anomalies and will continue to enhance our knowledge of the diagnosis and care of this condition.

Yes, we have come a long way in the last 25 years in the care of squint cases, and the future of this field of ophthalmology looks bright.

Frederick C. Cordes

VINTAGE OPHTHALMOLOGY: NOT A FABLE

Once or oftener upon a Time, a Physician who received his M.D. in 1919 found that he possessed many of the Attributes for specializing. Being Smart he had gone through Medical School without squandering his Gray Matter on the curriculum. He married Miss Mud City of 1920, whose Father had lost no money as Postmaster, Sheriff, Insurance Agent, and Dog Catcher. Having thus obtained What It Takes, the Doctor went away to the Polyclinic and soon learned to speak Ophthalmology (Vintage 1921) almost like a Native. In a few weeks he returned able to perform a creditable Extracapsular Lens Extraction and with a Mydriatic could fit Glasses which seldom Bounced Back. He was absent from Class the Day they studied Perimetry, but bought the first Refractoscope in the State with red and green Traffic Lights and by 1935 owned a Slit Lamp Corneal Microscope. This he exhibited at the County Medical Meeting but was heard to say privately that for most cases he could do as well with a Loupe and Oblique Illumination. This was probably Understatement, as he was found at the Board Examination with his Face in the Chin Rest, and the Patient at the Eyepiece.

He was strong for Civic Betterment and Death on the Charlatans who foist Bogus Eyeglasses on the unsuspecting Public, and did Right by those referring him Cataract Patients. He did not own a Tonometer, finding his own experienced Touch more Remunerative. Monocular Loss of Vision which did not yield to Violet Light administered over Months from a small Cyclotron to eliminate the Toxin, he found went on to Complete Blindness. Competitors, Consulted years later, often called these cases Absolute Glaucoma or Detachment of the Retina, but they, at that Stage, could do no more for them than he could. So it soon became widely said, as he was the First to Admit, that if he could not cure you No one could.

He said his most grateful Patients were those from whom he had removed an Eye, and charged them accordingly. He kept a Stud of Cadillacs, and was Director of the Mud City Institution for Savings. By the time his Income Tax had exceeded his

net Take, and his Kick-Back from the Purveyors of Glasses was in 5 Figures, he felt that the Eye Board ought to present him with a Certificate on Record, and on the possession of Diploma from Augenkliniks in Languages that he could read no better than he could understand when in Europe. He failed to see why at the Examination, Questions should be asked in the Basic Subjects. In Optics he had practised extensively for Twenty Years without knowing which Way and how much a Prism displaced an Object; in Pathology, he pointed out the Futility of wasting Time on Glaucoma, so long as the Production of the Aqueous is in Dispute; and why learn about the Relation of the Eye to General Diseases when the Patient is to be referred to an Internist anyway? If the Examiners did not know the Answers, why ask him? They could look them up just as easily as he could.

When advised to take Post Graduate Courses in certain Clinical Subjects, he replied that he was then devoting his Time to Teaching them to his Interns. Which could throw considerable Light upon a Number of Casualties which they encountered later. So when the Board explained patiently that repeating the same Mistake for Twenty Years does not qualify an Ophthalmologist for Certification, he persuaded a Delegate to the Annual Meeting to present a Resolution that the Boards should award Certificates to Ophthalmologists who had sacrificed fifteen to Twenty-five of their Best Years to the Practise of their Profession, without demanding too much detailed Knowledge of the Subjects which they had not studied during those Years. This Wording succeeded in deceiving the Gullible into the Belief that these Subjects had been Pursued during some unspecified Period with Painful and Exhaustive Diligence. His Chairman's address at the Eye and Ear Section Meeting of the State Medical Society concerned "Use of Penicillin in Ophthalmology and Otolaryngology." It did not differ materially in Wording from Fundamental Concepts presented in the Monographs distributed gratis by the Manufacturers of Fine Pharmaceuticals, and in Fact repeated the Misprints made in their Bibliographies and References. The Resolution failed of Passage and he now maintains that it is easy to become a Household Word and put 'em through the Wringer like a Plumber without learning the Drivel required by the Boards.

MORAL: HAVE YOU TRIED 10-PERCENT D.D.T.?

S. Judd Beach.

BOOK REVIEWS

EYE MANIFESTATIONS OF INTERNAL DISEASES. By I. S. Tassman, M.D. St. Louis, C. V. Mosby Company, 1946. Second edition. Clothbound, 614 pages, 243 illustrations including 24 in color. Price, $10.00.

The second edition of this book is similar in most respects to the first. For the benefit of those who did not have access to the first volume a short review of its contents may be of interest.

The first third is for the most part confined to general textbook considerations, such as the study of the anatomy, abnormalities and manifestations, and methods of examining the patient. There seems no particular reason for including these in a book with the title such as this since they are duplicated in all complete textbooks.

Beginning with page 269, the material from then on is exactly what the title implies. The method used is the presentation of a brief description of the disease to be considered, followed with the detailed account of the ophthalmic findings. These

conditions are clearly, concretely, and interestingly given.

The illustrations are satisfactory. This second edition coming so soon after the first indicates the good reception of edition one. There are 13-percent more pages in the second than in the first edition, as well as 40 new illustrations. About eight subjects not included in the first edition are now added.

It is always important to have a book of ready reference to the eye findings in general disease and this one is well-worth owning because it serves the purpose of including so much in one volume.

Lawrence T. Post.

LES ASPECT NORMAUX ET LES ANOMALIES CONGÉNITALES DU FOND DE L' OEIL. By Danis Marcelle. Report presented to the Societé Française d'Ophthalmolgie, August 25, 1940.

LES ASPECT PATHOLOGIQUES DU FOND DE L' OEIL DANS LES AFFECTION DE LA RÉTINE. By Gabriel Renard. Report presented at the March 25, 1946, meeting. Price, 1,000 francs.

Although these two contributions are units of a periodical which is published irregularly, it is fitting that they be given the dignity of a book review rather than be noted in the Abstract Department, for an abstract would insufficiently emphasize the scope of this undertaking. Each volume is in reality an atlas of ophthalmoscopy that covers a limited portion of the subject. Intrinsically, each is a book, and a very fine one, illustrated with beautifully reproduced colored drawings of the fundus. Together they have more than 150 pages of text.

The text of the earlier volume consists of a historical introduction and a brief description of the instruments and methods of ophthalmoscopy, including the use of filters and polarized light. A review of the anatomy of the structures accessible to ophthalmoscopic inspection forms the basis for interpretation of fundus manifestations. This material with its bibliography covers 98 pages. All fundamental facts are dealt with adequately yet without the padding that so many authors dare not leave out lest they be thought unknowing. In the remaining 101 pages of the earlier volume, congenital anomalies and variations of the fundus are described systematically. Each section has numerous black and white illustrations and an extensive bibliography. The 35 colored plates are constantly referred to for illustration of the text. Each colored plate also receives a brief comment on the facing page.

The second volume, that by Renard, is an atlas of 32 excellently printed colored drawings of the fundus in a variety of pathologic states. Degenerative lesions receive most of the discussion, and pictures exhibit many entities of diverse phases. This volume covers only a small part of fundus pathology, but, since it is numbered "one," it may be presumed that the plan is to cover other lesions in future volumes. The text consists entirely of thorough descriptions and discussions of each figure with excerpts from the clinical record of the patient whose fundus was studied.

F. H. Haessler.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

9

CRYSTALLINE LENS

Barraquer Moner, J. I. **Intraocular air injection in cataract extraction.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, April, pp. 339-343.

Barraquer illustrates the behavior of air injected into the anterior chamber in eyes with and without vitreous loss, and gives precise indications for the procedure. It is useful to prevent or ameliorate the consequences of inclusion of vitreous fibers in the wound when vitreous is lost, or when a disturbed postoperative relation between the iris and the corneal section is feared. The syringe containing air is sterilized in a glass container. (12 illustrations.) Ray K. Daily.

Barraquer-Moner, J. I. **Keratotomy with pneumatic fixation in phacoeresis.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, June, pp. 448-456.

The author's device for making the corneal section in a cataract extraction fixes the entire cornea through a vacuum, and cuts the limbus perpendicularly to the plane of the iris. The advantages claimed for such an incision are the adequacy of a smaller section, the accessibility of the root of the iris, and the easier introduction of corneoscleral sutures. In complicated cataract with occlusion of the pupil, the posterior synechia are separated from the lens by a spatula introduced through the peripheral iridectomy behind the iris. In occlusion of the pupil the occluding membrane after separation from the lens is perforated with the spatula and one or several small sphincterotomies made at the lower margin of the pupil. This relaxes the rigidity of the iris, and makes room for the manipulation of the suction tip and the delivery of the lens.

Ray K. Daily.

Bujadoux, A. **New method of keratotomy and its use in the operation of cataract extraction.** Arch. d'Opht., 1946, v. 6, no. 1, pp. 22-28.

Bujadoux discusses the advantages

and disadvantages of the Gräfe knife incision and the incision with keratome completed by scissors. He has designed a keratome resembling in shape the knife of Barraquer with which the incision can be made in a single motion without the use of scissors. The author's instrument is introduced into the eye at 9 o'clock for the right eye and at 2 o'clock for the left eye, a counterpuncture is made, and the movement continued until the section is completed. Good fixation of the eye is necessary and is accomplished by having the assistant control simultaneously a superior rectus suture and a fixation forceps at the insertion of the external rectus. The operator maintains fixation at 7 or 8 o'clock. The author states that if a conjunctival flap is desired it is possible to obtain one. After the keratotomy has been completed the lens can be extracted by any of the standard procedures.

Phillips Thygeson.

Cordes, F. C., and Barber, A. **Changes in lens of embryo after rubella.** Arch. of Ophth., 1946, v. 36, Aug., pp. 135-140.

The eye of a 7 to 8-week embryo was obtained through a therapeutic abortion. The mother had rubella during the sixth week of pregnancy. The lens showed definite retardation of development and differentiation, whereas the posterior segment of the eye seemed normal. The author suggests that the absence of the protection of the lids and of Descemet's and Bowman's membranes during the first three months of pregnancy may permit the toxic agent in the amniotic fluid to act fairly directly on the lens during this time. The presence of these barriers after the third month may explain the absence of initial changes in the lens after that time. (2 photomicrographs.)

John C. Long.

Corrado, M. **Action of proteolytic ferments on lens substance.** Ann. di Ottal., 1946, v. 73, Feb., pp. 91-113.

After summarizing the work of others on the digestive power of trypsin on normal lens substance Corrado presents his own studies of the in vitro action of trypsin on both the normal and cataractous lens. He used human lenses and those of oxen, calves, and rabbits. Sterile trypsin obtained by passage through a Berkefeld filter was used throughout.

The lens capsule was found to be impervious to trypsin. The ferment must have direct access to the lens substance in order to act upon it, and has a slightly greater digestive power on cataractous than on normal lens proteins. Corrado will report later his studies of the possible therapeutic value of trypsin, injected under the conjunctiva or into the anterior chamber, in postoperative lens remains and in traumatic cataract.

Harry K. Messenger.

Daily, R. K., and Daily, Louis. **A simple technique for the closure of cataract incisions.** Texas St. J. Med., 1946, v. 42, Aug., pp. 284-286.

A conjunctival incision is made 5 mm. from the cornea and the conjunctival flap is undermined to half of the corneal circumference. The flap is reflected to expose the limbus and a 6-0 double armed black silk suture is placed 3mm. in the episclera at the limbus. Section is then made. The two sutures are then passed through the conjunctiva as close to the cornea as possible. The section is enlarged and the operation continued. The suture is tied at the end of operation. The conjunctiva flap is sutured with a running stitch. The suture is water tight. The anterior chamber reforms early. Sutures are removed on the eighth day.

I. E. Gaynon.

Del Rio, G. P. **Electric cataract.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, March, pp. 245-252.

An electrician, 36 years of age, was struck by a 5,000-volt current. In addition to general injuries he had enormous hematomas of the lids, with extensive conjunctival chemosis and hematoma. Several months later he developed visual impairment, and was found to have bilateral, subcapsular lenticular opacities. The cataract in the right eye progressed to a complete milky opacity, and that in the left appeared to be stationary. The right eye was operated on and normal vision was recovered. The uncertainty of the prognosis because of possible damage to the fundus, and the relation to industrial compensation is discussed. The literature is briefly reviewed.

Ray K. Daily.

Druault, M. **Suture lines of the lens and arrangement of the fibres.** Arch. d'Opht., 1946, v. 6, no. 1, pp. 16-21.

The author reviews the embryology of the lens and discusses the arrangement of the suture lines in various animals and in man. He notes that in the newborn human the lens star has three branches whereas in the adult it may have from six to nine. He describes the entopic images of the lens sutures and their significance. The article is illustrated with thirteen drawings.

Phillips Thygeson.

Garcia Miranda, A. **Bilateral cataract extraction.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, April, pp. 344-350.

Garcia reviews the literature. He performed six bilateral extractions, and one eye became infected because of a dacryocystitis which was overlooked. The second eye had good vision. Five patients had good binocular vision.

Ray K. Daily.

Gruber, M. **Primary familiar dysplasia of the lens.** Ophthalmologica, 1945, v. 110, July-Aug., pp. 60-72.

This is the report of dominant hereditary formation of a bilateral membranous cataract in two generations of the same family. Three children of a father with this malformation of the lens had the same condition. After reviewing the literature and the various theories on the subject the author stresses the possibility of a primary dysplasia of the epithelium of the lens. He doubts that an intrauterine iritis is the cause of the membrane. Surgery is often difficult owing to the toughness of the membrane and an optical iridectomy may often yield better results than a forced discision or removal of the whole membrane with loss of vitreous.

Max Hirschfelder.

Haro, E. S. **Hereditary disk-shaped (ring) cataract.** Arch. of Ophth., 1946, v. 35, July, pp. 82-100.

The disk-shaped, or ring, cataract is a rare form of congenital cataract that has been reported relatively few times. The hereditary tendency has been reported in only one family. In July, 1944, a 10-year-old girl with congenital disk-shaped cataracts was brought to the eye clinic of Stanford University Hospital. Her history led to the study of a family, of 59 persons, of whom 16 have the same congenital anomaly.

All the members examined presented the type of cataract known as "disk-shaped," or "ring," characterized by the absence of the lens nucleus. This is due either to a failure of development of the primary fibers (Collins) or to a secondary resorption of the central parts, following an idiokinetic disturbance at an early stage (von Szily). This suggests the presence of genes controlling the development of the

nucleus. Apparently, such genes are dominant.

Association of these cataracts with ectopia lentis was found in all the patients examined. No other local or systemic anomaly was present. (5 illustrations, references.) R. W. Danielson.

Johnstone, I. L. **Heat ray cataract.** Trans. Ophth. Soc. U. Kingdom, 1944, v. 64, pp. 252-256.

Ten cases of heat ray cataract are reported. The author emphasizes the clinical findings. With a +12 lens in the ophthalmoscope one quickly sees the discrete posterior lens opacity silhouetted against the fundus reflex. With the use of the slitlamp the changes in the anterior lens capsule, the brassy reflex, and the granular appearance of the posterior cortex could be seen. Beulah Cushman.

Knüsel, O. **The morphology of an electric cataract.** Ophthalmologica, 1946, v. 111, April-May, p. 298.

The disturbance of vision occurred one year after injury with a high voltage current (18,000 Volts). He describes the morphologic characteristics of the cataract, and differentiates it from senile cataract and the cataracts of tetany and myotonia.

Alice R. Deutsch.

Meisner, W. **Intracapsular and extracapsular cataract extraction.** Revue Bulgare d'Opht., 1943, v. 2, pp. 129-136.

The results of the extracapsular cataract extractions are not greatly inferior to those of intracapsular extractions. The latter are more difficult, there is greater danger of vitreous loss, secondary hemorrhages and late detachment of the retina; the slight postoperative reaction is an advantage of the latter method. Alice R. Deutsch.

Moreu, Angel. **Postoperative hyphemia in cataract extraction.** Arch. de la Soc. Off. Hisp.-Amer., 1945, v. 5, June, pp. 467-471.

After a brief reference to the role of trauma in this complication, the author dwells in detail on the ocular metabolism of vitamin C. Experimental toxic or traumatic cataract in dogs in associated with a significant reduction of vitamin C in the aqueous, and an increase in its oxide. The stimulation of the orthosympathetic system by injections of acetylcholine or doryl into the anterior chamber led to the appearance of ascorbic acid in the aqueous. The atropinization of the eye was followed by its disappearance. After extracapsular extraction the vitamin C content of the aqueous is reduced; in intracapsular extraction it is entirely eliminated. These findings may explain the greater incidence of hyphema after intracapsular extraction. On the basis of the experimental data relative to the vitamin C content of the eyes. Moreu urges that the ortho-sympathetic system be stimulated preoperatively, and that massive doses of vitamin C be administered preoperatively, and for ten days postoperatively. Atropine should not be used, and dilatation of the pupil should be obtained through the use of sympathetic stimulants, such as concentrated epinephrine. Ray K. Daily.

Munoz, J. A. **Congenital zonular cataract, tetanic cataract, and rickets.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, March, pp. 253-264.

The literature is reviewed and a family reported, in which the father, five sons, and one daughter had zonular cataracts; the mother and two daughters had normal eyes. All the affected children had dental defects; only one had bony deformities in the hands, which could be attributed to rickets.

One child with normal eyes had chorea. The illustrations show that the form of the opacities was somewhat different in each case, but all were situated in the embryonal and fetal nuclei. Of the seven patients, two were emmetropic, three hypermetropic and two myopic. The anteroposterior axis of the lenses was not shortened; the blood calcium was normal. During a four-year period of observation the opacities were stationary. As the tabulated data show, these cataracts could not be attributed to tetany. The dental defects suggest rickets as the possible etiology probably because of a calcium deficiency in the mother. (2 illustrations, 1 table.)

Ray K. Daily.

Samuels, Bernard. **Proliferation of lens epithelium.** Amer. Jour. Ophth., 1947, v. 30, Jan., pp. 1-11. (1 color plate, 28 figures, references.)

Schmid, A. E. **A contribution to the knowledge of contusion and massage cataract: permanent and transitory types.** Ophthalmologica, 1946, v. 111, June, pp. 365-371.

The author describes the eyes of a patient with bilateral congenital ectopia lentis. The lens in the right eye was luxated into the anterior chamber and caused considerable increase in tension. The anterior surface of the lens was in contact with the posterior corneal surface and was the site of superficial transitory opacities which were temporarily increased when a needling was tried. The opacities had characteristic marginal indentations and changed their shape or disappeared whenever the lens-cornea contact was interrupted. The localization of the opacities in either the lens capsule itself or the epithelium was very difficult. The author compares the opacities with Vogt's disseminated subepithelial glaucomatous cataract which is similar in shape but different in localization. This cataract is also a permanent opacity.

The morphologic picture of contusion cataract and of a special type of cataract after massage are similar and characterized by concave marginal indentations. The localization depends on the degree of pressure. According to the strength of the pressure it produces an opacity that is superficial and transient or deep and permanent. (References.)

Alice R. Deutsch.

Schmid, A. E. **Light reflexes in spherophakia.** Ophthalmologica, 1946, v. 111, June, pp. 359-364.

The author describes his own experimental and clinical studies on the origin and nature of the complex light reflexes that occur in spherophakia and microphakia. His patient had a luxation of the lens into the anterior chamber in her right eye and a subluxation of the lens into the vitreous in her left eye. The light reflexes could be observed in different positions of the lens. Whenever the focused pencil of light of the slitlamp reached the lens-equator under a certain angle a small semicircle of light originated on the posterior surface of the lens. In the optimal angle of incidence of the beam a part of the beam was reflected under the surface of the lens back to the point of entrance so that a ring of light encircled the whole lens. This is the phenomenon of total and continuous reflection along the border planes. A colored plate and diagrams elucidate the appearance and origin of these rather complex phenomena. (6 figures, references.)

Alice R. Deutsch.

Smith, D. P. **Iridencleisis—a modification.** Brit. Jour. Ophth., 1946, v. 30, Oct., pp. 589-590.

On a patient 80 years of age with bilateral chronic glaucoma and cataract and with minimal vision in the better eye, an iridencleisis was done and later a cataract extraction. The first operation was modified so that the subsequent one would not derange the filtering scar. The keratome incision was made about 5 mm. above the limbus and only one iris pillar was incarcerated. The area was covered by a sliding flap of conjunctiva. The cataract extraction was successful and visual acuity was 5/8. Morris Kaplan.

10
RETINA AND VITREOUS

Ammann, E. **Heredity of hemeralopia hereditaria and tapito-retinal degeneration.** Ophthalmologica, 1946, v. 112, Aug., pp. 78-87.

A genealogic tree in which 53 blood relatives in five generations and 38 relatives by marriage are charted is described and analyzed. The inheritance in all four generations was direct. There was no interrupted line. Manifestly sound fathers and mothers never had afflicted offspring. The propagation of the disease through afflicted mothers is questionable. The younger offspring in an afflicted family were normal. (1 family tree, references.) F. Nelson.

Appelmans, M. M. **Angiomatosis of the retina in the child.** Bull. Acad. roy. de med. de Belgique, 1945, v. 10, no. 3, pp. 91-119.

The author reviews the history of angiomatosis and reports his observations on the eye of a child, four years of age. He observed the evolution of the disease from the stage of amaurotic cat's eye until enucleation became necessary two years later. He also describes histologic preparations from the eye. (9 photomicrographs and extensive bibliography.) Jose Saenz Canales.

Arjona, J. **The syndrome of Groenblad and Strandberg.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, March, pp. 277-290.

An extensive review of the literature accompanies this report of three cases of angioid streaks and pseudoxanthoma elasticum in women. Most of the patients with this syndrome are men. One of the three patients, 49 years of age, had retinal hemorrhages as well, which caused considerable reduction in visual acuity. The other two patients were sisters, who came because of a mild conjunctivitis; their skin lesions led to the discovery of the syndrome. Their fundus lesions were slight, and vision was unimpaired. (3 illustrations.) Ray K. Daily.

Arruga, H. **The fundus of the new-born.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 835-839.

Arruga points out the importance of familiarity with the appearance of the fundus of the new-born, in order not to make erroneous diagnosis and prognosis. Retinal hemorrhages are frequent in the new-born; they occur during parturition and are always absorbed within a few weeks, without leaving traces. The optic disc may appear grayish white, with hazy borders, suggestive of a mild optic neuritis. This appearance is due to the delayed retrogression of myelin, which impregnates the nerve fibers at the level of the lamina cribrosa. At 10 or 12 months of age the optic disc assumes a normal appearance. (5 colored fundus drawings.) Ray K. Daily.

Arruga, H. **Detachment of the retina.** Arch. of Ophth., 1946, v. 36, Nov., pp. 531-536.

This is a "must" article for those interested in retinal detachment surgery. Every sentence is significant. A few outstanding statements follow.

Gonin's demonstration that retinal detachment is cured by sealing the retinal tears clarified and oriented the previously vague conceptions of the etiology, pathogenesis, and therapy of this process.

Detailed studies of the ocular fundus and histologic examinations of enucleated eyeballs have demonstrated that in idiopathic detachment the retina is much altered. It is strange that retinal detachment is not of more frequent occurrence. In histologic studies, atrophic and degenerative lesions reduce the thickness of the retina to one-third normal. In 18 years Arruga has observed more than 40 cases of retinal holes without detachment.

In order that the retina may become detached, the margins of the tear must be inverted slightly toward the interior of the eye, so that the vitreous strikes against them with movements of the eyeball.

The retina does not become detached if it is adherent to the choroid as well as to the framework of the vitreous. For this reason, chronic and degenerative processes are more likely to predispose to retinal detachment than are intense chorioretinal inflammatory processes.

Trauma as the determinate cause of retinal detachment does not have the important role which has been conceded to it in the past. Retinas do not become detached unless they are diseased, except after extensive traumatism. More frequent causes are a blow on the cranium, a fall on the heels, sneezing, coughing and, above all, excessive stooping.

The fundamental concept of the movements of the eyes as the factor which initiates and increases the detachment is becoming more definite, but the varieties of its evolution show that other factors are also important. One known factor of influence is the size of the retinal rent. When the tear is small, there is rapid resorption of the subretinal fluid; when the hole is large, resorption is slow. The rapid formation of large tears indicates extreme friability of the retina or the existence of extensive adhesions between retina and vitreous, which render treatment ineffective. The factor of time, which used to be considered of such importance and which enhanced the urgency of operation, is being disregarded. The urgency in most cases does not lie in surgical intervention so much as in the need for bandaging the patient's eyes and enforcing relative repose.

Another of the factors which has most influence on the evolution of the retinal detachment and on its cure is the condition of the choroid. A detachment which is replaced with rest has a good prognosis, for the choroid is demonstrated to be in good condition for reabsorption. The vitreous acts as a foreign body on the choroid, which is finally destroyed. For this reason, all retinal detachments of more than two years' duration are accompanied by complete atrophy of the choroid. Consequently it is advisable to localize the diathermic action as much as possible. A thorough study of the fundus is necessary so as to avoid lavish use of diathermy over an extensive area. Immediate repetition of the operation is advisable only when tears appear which were not reached by the preceding diathermic action. R. W. Danielson.

Azcoaga, J. M. **Retinal arterial tension in general hypertension.** Arch. de

la Soc. Oft. Hisp.-Amer., 1945, v. 5, July, pp. 519-557.

The author presents a detailed physiologic study of the retinal circulation. He uses the Bailliart's ophthalmodynamometer. The study of the retinal arterial pressure is very useful in determining the stage of development of general hypertension. The retinal circulation is under greater pressure than would be suspected from the sphygmomanometric reading. The fundus picture does not necessarily correspond to the type of hypertension; since plethoric patients show consistently fewer changes, two types of hypertension, red and pale, must be distinguished. Renal and essential malignant hypertension cannot be differentiated. (14 illustrations.) J. W. McKinney.

Bailliart, P. **Lectures on the vascular pathology of the retina.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 898-911.

This is a condensed summary of Bailliart's lectures. Emphasis is placed on the fact that the retina is an extension of the brain, and the retinal blood vessels are subject to the same regulations as the cerebral vessels. The examination of vascular retinal pressures is described and the value of ocular capilloroscopy to the internist and the neurosurgeon made clear.

The etiology of arterial hypertension, and its ocular symptoms are discussed in detail; among the early symptoms are cloudiness of vision, and the need for increased illumination for near work. The fundus at this time shows edematous areas in the form of striae or points, arteriovenous compression, and punctate obliteration of some of the capillaries. If the retinal arterial tension is higher than half the brachial pressure, it is indicative of parietal hypertension; if it is lower, it indicates obstruction below the level of the retinal vessels; in either case it means a disturbance in the cerebral circulation, and a disparity between the retinal and humeral pressures is a poor prognostic sign. Hypertension without these retinal changes is relatively benign, and is well tolerated.

For a clinical prognosis the examiner should note hyaline degeneration, capillary failure, the state of the conjunctival vessels, the results of entoscopic examination, and the state of the arterial retinohumeral pressures. A retinal arterial tension higher than half the brachial indicates retinal angiospasm, and also cerebral and renal angiospasm. A retinal arterial tension lower than normal indicates failing cerebral circulation, and such patients are apt to suffer hemianopsia or hemiplegia, even in the absence of obvious cardiac or renal changes.

In malignant hypertension, which the ophthalmologist encounters in one percent of cases, and which is due to capillary inadequacy the first signs are arteriovenous compression, followed by hemorrhages and edema at the posterior pole. Particularly grave are those which set in with thrombosis of the central retinal vein. It is really a collapse of the venous walls, rather than a true thrombosis. Retinal degeneration follows, with profound macular changes due to a disturbance in the choriocapillaries. Such changes in the retina indicate that similar processes are taking place in the higher cerebral centers. Ray K. Daily.

Bailliart, P. **The retinal capillaries.** Revue Bulgare d'Opht., 1943, v. 2, pp. 34-43.

The anatomy of the retinal capillaries is described. They are ophthal-

moscopically invisible but can be examined by means of the capillaroscopy of Fortin and the endoptoscopy of Scherer. He discusses these methods in detail and stresses their importance for a better understanding of the retinal capillaries in health and disease.

Alice R. Deutsch.

Bischler, V. **Pigmentary retinitis following measles.** Confinia Neur. Basek, 1944-45, v. 6, no. 5, pp. 270-277.

The author reviews the literature and adds a case of pigmentary retinitis following measles. The condition is rare and may occur with any exanthemata. Sudden amaurosis occurs about the fourth to eleventh day of measles and is followed by slight recovery of vision. There is attenuation of the retinal blood vessels, and the fundus picture may resemble that of embolus of the central artery of the retina. The tapetoretinal degeneration appears several months or years after the acute condition. The retina may have scattered masses of pigment, a fine pigmentation, and small yellowish-white spots. At first it is progressive, then remains stationary, in contrast to the slow progression to blindness of retinitis pigmentosa.

Orwyn H. Ellis.

Bishay, A. **Quinine amblyopia.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 281-287.

The author presents seven cases of quinine amblyopia after reviewing the theories of its etiology. The two predominant theories are a direct toxic effect on retinal cells and an anemia of the retina caused by extreme constriction of retinal vessels due to the quinine. The author concludes that whatever else is involved, a personal sensitivity to quinine must certainly be a factor. In his treatment, large doses of strychnine and paracentesis were employed with better than average results. (4 diagrams.) Morris Kaplan.

Brückner, A. **The X-ray treatment of the retinoblastomas.** Revue Bulgare d'Opht., 1943, v. 2, pp. 55-63.

A child, 15 months of age, is described who had advanced bilateral retinoblastoma. After the enucleation of the worse eye the other was given intermittent doses of X rays. After temporary regression of the tumor, there was a massive recurrence, secondary glaucoma, and orbital metastasis.

Alice R. Deutsch.

Ciotola, Guido. **Further observations on heparin treatment of thrombosis of the central vein of the retina.** Boll. d'Ocul. 1945, v. 24, Jan.-March, pp. 35-51.

In addition to the report published in the January 1941 issue of this periodical on a new treatment of this form of thrombosis by heparin the author now reports 35 more cases. A short history is given of each. The age of the patients ranged from 36 to 78 years. The thrombosis was total in 16 patients. The treatment was started from 2 to 90 days after the onset of the disease and the duration of treatment was 10 days, rarely longer. In five patients the vision remained stationary and in the others it deteriorated. A reëxamination of 21 patients after one year showed still better vision in nine and further deterioration in five. The fundus examination showed a partial absorption of hemorrhages. The rapid improvement of vision during the treatment was due to a reduction of retinal edema as a result of the improved venous circulation. The treatment caused no secondary disturbance other than a transient rise of temperature in a few patients. Melchiore Lombardo.

Cornet, E. **Retinopexies.** Ann. d'Ocul., 1946, v. 179, Feb., pp. 112-118.

Retinopexies are surgical procedures for relief of retinal detachment. They produce an adhesive chorioretinitis limited to the zone surrounding tears or generalized detachments, and affect vitreous pressure. Surgical treatment should occlude small tears, include the entire zone involved, and exclude the extension of the detachment. Because of its simplicity and uniformity in producing solid cicatrices, galvano-cautery is preferred to diathermy. Cauterization of the vortex veins will result in severe hemorrhage. Retro-retinal cystic degeneration may be primary or secondary and is more frequent than is usually believed. It occurs in 50 percent of retinal detachments in patients under the age of 40 years. Destruction of the cyst is considered essential for the permanent cure of detachments. If pockets of supraretinal fluid exist far from a tear, a supplementary perforating puncture is made in the affected area. For hypotension subconjunctival injections of 1/1000 solution of mercury cyanide in 5 to 10-percent sodium chloride solution is used. If the vitreous is retracted scleral resection should be considered. In detachments with tears, Gonin's operation or one of its modifications is advised. In generalized detachments the operations of Weve-Sichel, or de Wecker-Soudielle are preferred. The author's nonperforating sclerocyclectomy for vitreous retraction includes an annular excision of a 2 to 3-mm. band of sclera near the ora serrata with corresponding resection of the anterior ocular muscles.

Chas A. Bahn.

Dominguez, D. D., and Girones, E. A. **Recurrent edema of the macula.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, Jan., pp. 38-54.

An exhaustive review of the literature, and a report of four cases are presented. The author believes in the identity of this affection with that described by Horniker as chorioretinitis centralis serosa. It is probably as frequent in Europe as in Japan, and the diagnosis is often missed because of inadequate attention to the subjective symptoms, and of failure to make a detailed examination of the macular region. Etiologically it is similar to angioneurotic edema, perhaps allergic in origin. In spite of the frequent recurrences the prognosis is favorable. (2 illustrations.)

Ray K. Daily.

Esente, Ivan. **Diabetic retinosis, simple and complicated.** Riv. di Oftalm., 1946, v. 1, April, pp. 249-277.

In addition to an extensive review of the literature, the author discusses his own observations that suggest the clinical importance of distinguishing between the ophthalmoscopic and pathogenetic characteristics of "simple" and of "complicated" diabetic retinosis. Neurohormonal disturbances, probably originating in the hypophysis, may initiate simple diabetic retinosis in the absence of hypertension as well as hyperazotemia. Therapeutic indications may be derived from this ophthalmoscopic differential-diagnostic clue.

K. W. Ascher.

Falcone, G. **A case of juvenile disciform macular degeneration.** Indian Med. Gazette, 1946, v. 81, June-July, pp. 241-242.

This non-inflammatory disease occurs during the second and third decade of life and tends to resolve in a few months. The exudative mass has degenerative rather than inflammatory characteristics. Coats' disease, tubercle, and malignant melanoma are to be differentiated from it. In the author's pa-

tient, a European male, aged 29 years, the disease affected one eye and later the other and healed completely.

F. M. Crage.

François, J. **Treatment of thrombosis of the retinal veins by heparin.** Bull. de la Soc. Belge d'Opht., 1945, no. 82, Nov. 25, pp. 19-23.

The author discusses the formation of thrombosis in the retinal veins after trauma or inflammation, and believes that the use of heparin in these cases is justifiable. Herapin is the principal anticoagulant of the animal organism and since it inhibits thrombin formation, it is indicated in these cases.

Heparin was given to 17 patients; the thrombosis was located in the central vein in 12 of these and in five was located in one of the branches. For a period of 10 consecutive days heparin is injected intravenously every six hours. Eighty milligrams are given for two to three days, then 50 milligrams until a total of two grams is given.

A complete cure resulted in seven of these patients whose clinical records are presented in detail.

M. R. Cholst.

Gordon-Napier, G. **An electrolysis apparatus devised for retinal detachments.** Brit. Jour. Ophth., 1946, v. 30, Aug., pp. 478-485.

The author describes the trials of procuring the parts and assembling an electrolysis machine in India during the war. The equipment was make-shift and the needles were ordinary sewing needles but the finished product served well for three years. Of 24 detached retinas, 12 were attached successfully at first operation, 4 after a second operation, and 8 remained defective. (4 diagrams.) Morris Kaplan.

Gruber, M. **Histologic findings in the fundus in Fahr's nephrosclerosis.** Ophthalmologica, 1944, v. 107, Jan.-Feb., pp. 87-90.

The vessels of the choroid in Fahr's nephrosclerosis are similar to those of the kidneys. There are thickening of the intima and media and very few inflammatory processes. There were excrescenses of the pigment epithelium protruding into the rod and cone layer of the retina. Max Hirschfelder.

Hagedoorn, A. **Instrument for locating retinal ruptures during operation.** Arch. of Ophth., 1946, v. 36, Aug., pp. 225-226.

This instrument is designed for the scleral transillumination of the globe. A minute light is enclosed in a metal tube which is affixed to the globe by teeth. A metal wing is attached to the tube to aid in manipulation and as an indicator of the position of the light. It is used in the same manner as the Goldmann instrument. The author describes its use in the localization of retinal tears and of scleral foreign bodies. (2 illustrations.)

John C. Long.

Halbron, P., and Rozan, A. **Five cases of macular lesions of undetermined etiology.** Ann. d'Ocul., 1946, v. 179, March, pp. 131-137.

Five patients with vision from 20/40 to 20/20 had irregularity of macular pigment, diminution of macular reflex, and slight retinal opacity as the only pathologic findings. Practcially all had had nutritional deficiencies as prisoners of war. None had received direct injuries. Chas A. Bahn.

Hall, G. S. **The ocular manifestations of tuberous sclerosis.** Quart. J. Med., 1946, v. 15, July, pp. 209-220.

Frequent ocular manifestations of

tuberous sclerosis are retinal nodules (phakomata) of which there are two types. In one type small, greyish-white, single or multiple nodules occur in any part of the retina; in the other type a large mass usually develops in the region of the optic disc, projects into the vitreous, is frequently cystic, and may produce optic nerve atrophy. The nodules are usually avascular and may be associated with alterations in the blood vessels. The lesions are composed almost entirely of glial cells, and primitive fibers. There is a whorl-like arrangement of cells with brush-like areas of gliosis. Cystic degeneration may or may not be present. The lesion can become a true blastoma.

Rarely nodules may occur in the lens and cause opacity. Histologic findings in such an eye after post-mortem are presented. Orwyn H. Ellis.

Krause, A. C., and Sibley, J. A. **Metabolism of the retina.** Arch. of Ophth., 1946, v. 36, Sept., pp. 328-348.

This monograph on the metabolism of the retina discusses the subjects under the headings of hydrogen-ion concentration, organic phosphate, oxidation-reduction potential, respiration and glycolysis, anoxia, general metabolism, respiratory quotient, fat metabolism, formation of ammonia, glycogen, carbon dioxide anhydrase, acetylcholine, and detached retina.

R. W. Danielson.

Lemoine, Albert N., Jr. **Retinoblastoma.** Amer. Jour. Ophth., 1947, v. 30, Jan., pp. 52-55.

Lipkina A. I. **Tissue therapy of retinitis pigmentosa.** Oftal. Jour. (Odessa), 1946, pt. 2, pp. 29-33.

Verbitskaia reported favorable results in 77.3 percent of 110 patients treated according to the Filatov method which consists of intramuscular injections of cod liver oil, subconjunctival implantation of placental tissue, subcutaneous implantation of placenta and preserved skin. In this study the procedures used were subcutaneous injections of a specially prepared extract of leaves of aloes, kept on ice in darkness for 15 days; implantations of preserved and autoclaved cadaver and animal skin; and a combination of the two procedures.

Of the 30 patients in this study 22 were under observation less than six months, and four for one year. Almost all of them had advanced lesions. Sixteen patients were treated with an aqueous extract of leaves of aloes. The favorable effect of therapy was manifested by an increased visual acuity, extended visual field, improved reading ability, and improved dark adaptation. Only one patient was unimproved. In one patient vision rose from imperfect light projection to 0.1, and in the other from 0.01 in each eye to 0.3 and 0.2. Thus, a patient with total visual disability recovered the ability to work, read, and write. This experience justifies the assumption that the improvement would be even greater if treatment were applied early. Two tables give brief summaries of the treatment.

Ray K. Daily.

Longhena, Luisa. **Light perception in detached retinas.** Riv. di Oftalm., 1946, v. 1, April, pp. 225-244.

Painstaking study of dark adaptation was performed on twenty patients suffering from retinal detachment. Campimetry at reduced illumination was also done using a perimeter of long radius and white, red, and green targets. For the adaptation test, Birch Hirschfeld's instrument was used.

After exposure to bright light for ten minutes, the eye was tested every three minutes during a period of forty minutes. In nine of the patients operation seemed to be contraindicated and in one a spontaneous recovery of the detachment occurred. Ten eyes were operated on and in seven of these there was complete restitution. One showed some postoperative improvement, one relapsed, and one became worse after the surgical intervention. Three weeks after the operation no adaptation was present in the detached parts of the retinas. It returned, however, if surgical or spontaneous recovery occurred. It took a varying period of months to redevelop. It is important to stress that the retinal pigment layer probably plays the main role in dark adaptation. In spite of the fact that it is in physical contact with the reattached inner retinal layers, it does not start to function immediately. A certain period of time is necessary to overcome an unknown organic or functional disturbance of the pigmentated retinal epithelium.

K. W. Ascher.

Maggiore, Luigi. **The functional relations between the pigment epithelium and the neuroepithelium of the retina.** Revue Bulgare d'Opht., 1943, v. 2, pp. 113-128.

This paper represents a detailed clinical, pathological, biochemical and physiological study of the importance of close contact between the pigment epithelium and the neuroepithelium for the maintenance of perfect visual function, especially, in relation to various forms of retinal detachment.

Alice R. Deutsch.

Matas, B. C. **Retinitis punctata albescens.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, March, pp. 269-276.

The case reported occurred in a 30-year-old man with inadequate dark adaptation since childhood. He had no consanguineous antecedents. Ten of his 19 siblings were living, and all had a history of the same disturbance, which, however, disappeared when they reached the age of twenty years. The patient noted a progressive impairment of vision during the last three years, with increasing difficulty in reading, particularly of red or blue letters. The fundi contained disseminated white points, particularly numerous at the posterior pole. The foveal reflex was absent in both eyes. There were no pigment changes. Vision was reduced to 1/10. The fields were normal. The literature on the subject is briefly reviewed, and the need for therapeutic research is emphasized. (Visual fields.)

Ray K. Daily.

Mosquera, Sanchez. **Two cases of retinal disinsertion.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Sept., pp. 803-805.

Sanchez reports two cases of slowly developing retinal disinsertion in young men, in good general condition; the patients were not myopic and there was no history of trauma or infection. The vitreous, the ciliary body, and the lens showed none of the changes frequently found in old retinal detachments. Both were cured by diathermy coagulation. The slow evolution of retinal disinsertion is explained by the fact that the vitreous does not seep through as easily when there are no retinal holes and disinsertions usually occur in eyes with healthy vitreous. The organic integrity of the eye accounts for the better prognosis. This type of disinsertion with a characteristic clinical course is attributed by the author to cystic degeneration of the retinal periphery caused by embryologic malformation or consecu-

tive to an intraretinal hemorrhage that occurred during gestation or as a result of obstetric trauma. (4 illustrations.)

Ray K. Daily.

Nastri, Francesco. **Further researches on pathogenesis of diabetic retinitis.** Boll. d'Ocul., 1945, v. 24, Jan.-March, pp. 19-34.

The writer studied the behavior of vitamins A and K in the blood of patients affected by this retinal lesion and came to the conclusion that in these cases hepatic disfunction must not be excluded from consideration. (Bibliography.)

Melchiore Lombardo.

Pickard, R. **The perioptic atrophic ring.** Brit. Jour. Ophth., 1946, v. 30, Aug., pp. 437-445.

These atrophic rings that are occasionally seen around the optic disc are frequently associated with glaucoma, cavernous atrophy, and retinal sclerosis. The study was made on 826 consecutive patients over 50 years of age. Most of the patients exhibited unmistakable narrowing of the retinal vessels in almost direct ratio to the amount of the atrophy. The author assumes that this narrowing is primarily found in the vessels of the circle of Zinn. (4 tables.)

Morris Kaplan.

Pines, N. **Diagnostic and clinical value of some forms of retinal angiospasm.** Brit. Jour. Ophth., 1946, v. 30, Aug., pp. 470-476.

Painstaking exploration of the retinal arteries in the red-free light of a Wolf ophthalmoscope sometimes reveals local constrictions of the lumen. The significance of this local angiospasm only becomes clear when the findings are correlated with careful oscillometric studies of the vessels of the arms and legs. It will be found that they are an index of the state of general angiospasm and of some value in prognosis.

Morris Kaplan.

Rubino, A. **Retinal detachment with disinsertion due to a large intraretinal cyst.** Riv. di Oftalm., 1946, v. 1, March, pp. 149-155.

Weve distinguishes three kinds of retinal cysts: those without a retinal detachment, those secondary to a detachment, and those causing a retinal detachment. A case of the latter type is described. A man, aged 38 years, had an extensive retinal detachment involving the temporal lower retinal quadrant of his left eye with a disinsertion extending along the periphery from the 4-o'clock to the 7-o'clock position. In the lower nasal quadrant, the convex border of an enormous retinal cyst was visible two disc diameters from the papilla; its distal border was invisible. Operation consisted of transcleral diathermy coagulation; a double barrier coagulation was performed along the disinsertion, and finally, the cyst was evacuated by perforating diathermy. Reattachment of the retina and collapse of the cyst became permanent. Final vision was 0.1 because of a small central field defect whereas the peripheral field was only slightly constricted in the nasal upper quadrant. A pigment line indicated the outlines of the collapsed cyst. The author advocates the use of the perforating type of operation only in cases characterized by large retinal cysts.

K. W. Ascher.

Schneider, R. W., Lewis, L. A., and McCullagh, E. P. **Plasma proteins. I. Alteration in diabetic retinitis.** Am. J. M. Sc., 1946, v. 212, Oct., pp. 462-465.

Clinical and biochemical studies were made in 31 cases of diabetic retinitis to determine a relationship between cer-

tain alterations in the plasma proteins and retinal changes and to determine whether a high intake of protein would change either or both of these disorders.

In inadequately treated diabetes mellitus one frequently finds typical changes that consist of a reduced level of albumin and an increase in B globulin. The total protein may be normal or slightly reduced. Unless such complications as infection, renal insufficiency, or particularly retinitis exist, the plasma protein level can be restored to normal. Where renal disease accompanies the retinitis, the plasma protein abnormalities can not always be corrected.

The diabetic retinitis in the male patients was not recognized until diabetes had been present from 12 to 25 years and in women in from 2.5 to 22 years. Four patients showed improvement. In two of them practically all the form and color field defects disappeared in a few months. Subjective visual improvement occurred in two patients. The greatest improvement in retinal changes occurred in those in whom the high protein intake restored the plasma protein to normal. High protein diabetic diets are valuable as an adjunct in the prevention and treatment of diabetic retinitis. Francis M. Crage.

Stallard, H. B. **Retinal detachment due to war trauma.** Brit. Jour. Ophth., 1946, v. 30, July, pp. 419-429.

An analysis of 96 cases of retinal detachment that occurred in a field force is made; of these only 20 resulted from war injuries. Most of these 20 had serious ocular wounds and retained foreign bodies as well as the retinal separation. In one eye in which the retina was separated in three quadrants without a tear spontaneous reattachment occurred and the vision became normal. A second less extensive detachment also healed spontaneously. Seventeen eyes were operated upon, 11 successfully. (3 illustrations.)

Morris Kaplan.

Stallard, H. B. **Bilateral symmetrical cystic detachment of the retina.** Brit. Jour. Ophth., 1946, v. 30, Sept., pp. 547-548.

Two young patients presented almost identical bilateral, symmetrical, cystic, retinal detachments, all in the upper temporal quadrant. All were symptomless and were discovered during routine examination. All eyes were otherwise perfectly normal. One retina became reattached spontaneously and the others were operated upon by a single application of surface diathermy followed by a single puncture with the diathermy needle. Postoperative recovery was uneventful and complete. (2 illustrations.) Morris Kaplan.

Streiff, E. B. **The modification of the retinal arterial tension in different positions of th body and head.** Revue Bulgare d'Opht., 1943, v. 2, pp. 151-156.

The retinal arterial blood pressure does not change with the position of the head and body under normal conditions but does so in retinal hypertension and hypotension. Alice R. Deutsch.

Wagner, H. **Changes in the fundus in Fahr's nephrosclerosis.** Ophthalmologica, 1944, v. 107, Jan.-Feb., pp. 83-86.

Malignant nephrosclerosis is usually characterized by a severe arteriolosclerosis with necrosis and endarteritis obliterans in the kidneys. It is the end result, when the purely vascular "red" hypertension changes to the "white" toxic hypertension due to the disturbed

kidney function. Clinically it is characterized by intracranial pressure, insufficiency of the kidneys, vascular hypertension (especially the diastolic pressure), loss of weight, uremia, and fundus changes. Fahr distinguishes a still more fulminant nephrosclerosis from the classical picture described above. It affects younger people, is extremely malignant, and is based on exogenous, toxic and infectious influences. One finds necrotic and endarteritic processes in the kidneys similar to the periarteritis nodosa of Kussmaul. The author hopes that ophthalmoscopy may make the differential diagnosis possible which otherwise can only be assumed. He found, aside from the usual ophthalmoscopic findings of malignant hypertension, unusual pigment spots, partly surrounded by a small white area in patients who were later found to have Fahr's nephrosclerosis. Although he is not certain that the finding is constant, he believes it to be an important one. (2 photographs.)

Max Hirschfelder.

Weber, E. **The anterior barrier of the vitreous. The spontaneous detachment of its lenticular plica in senility—a new slitlamp diagnosis.** Ophthalmologica, 1944, v. 107, Jan.-Feb., pp. 108-115.

The author distinguishes a free plica of the vitreous lamella (in the region of the zonula) from that part of the anterior vitreous which covers the posterior surface of the lens as a so called "lenticular plica." Ordinarily, it is impossible to see it with the slit lamp. In young people it is rather firmly adherent to the lens itself and only the strong force of serious injuries will lead to its partial detachment. A different situation is found in people of advanced age. In such people a mild trauma may produce a total detachment of the lenticular plica of the anterior vitreous. Myopia also predisposes to such a condition. The fact that this plica is much more easily detachable in elderly persons explains the relative ease of intracapsular extraction in such persons as compared with the same method applied to young patients. (14 illustrations, partly colored.)

Max Hirschfelder.

Weekers, R. **The role of light in the pathogenesis of essential detachment of the retina.** Bull. dela Soc. Belge d'Opht., 1945, no. 82, Nov. 25, pp. 29-34.

Cases of detachment of the retina were studied for a period of 15 years at the University Clinic at Liége. Retinal detachments secondary to neoplasm, inflammation, operation, or trauma were disregarded. There were 208 idiopathic detachments. In the majority, predisposing factors such as myopia and arteriosclerosis, with or without hypertension, were found. A graph is presented which reveals an increase in the frequency of affection from March to July and a decrease from July to February. The summer and spring revealed an incidence of 31 percent and 30 percent respectively, which decreased to 21 percent in the autumn and 18 percent in the winter.

The author feels that strong light could produce a tear in a retina predisposed by arteriosclerosis or myopic choroiditis. He believes that the problem could be studied experimentally in a dog with renal ischemia and hypertension (Goldblatt kidney) by exposing the eye of such a dog to strong light.

Weekers urges the use of tinted and dark glasses during the sunny periods of the year as a prophylactic measure for predisposed individuals.

M. R. Cholst.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Alm, Inguar. **Primary tumors of the optic nerve and their relation to Recklinghausen's disease.** Acta Pediat., 1945, v. 32, no. 3-4, pp. 262-269.

The author presents two cases of primary tumor of the optic nerve in children and discusses the relationship between Recklinghausen's disease and primary tumors of the optic nerve. He supports the view that neurofibromatosis is a disease of nerve cells and axis cylinders and secondarily causes proliferation of the surrounding supporting and protective tissues. The family of one of the patients exhibited manifestation of neurofibromatosis in three successive generations. The other patient had a primary tumor of the optic nerve and neurofibromatosis of the hip. (12 figures.) I. E. Gaynon.

Dell'acqua, G., and Poppi, U. **Neuromyelitis optica.** Riv. Oto-Neuro-Oft., 1942, v. 19, no. 1, pp. 1-21.

A woman, 20 years of age, with an acute paraplegia, hypoesthesia from the axillas down, bilateral choked discs and central scotoma died two months after onset of her disease, from bronchopneumonia. The lower part of the thoracic and the upper part of the lumbar spinal cord showed complete destruction of the nervous tissue. Above and below this region, disseminated lesions of demyelinization, necrosis, but no proliferation of neuroglia or perivascular infiltration were found. Secondary degeneration of Goll's column was present, the brain and cerebellum were free, and the optic nerves, when stained with Weigert's solution, showed paleness of their marginal fascicles, pial thickening, and an increased number of nuclei in the interfascicular tissue. Thus, an acute medullary necrosis was associated with an optic neuritis. The lesions had a different clinical course and a very different pathologic explanation. The combination should not, in the opinion of the authors, be considered a definite clinical syndrome. (11 figures.) K. W. Ascher.

Diez, M. A. **Acute epidemic papillitis.** La Semana Méd., 1946, v. 53, Sept., pp. 509-534.

The author describes six cases that occurred in children. The record is intended to supplement ten cases reported by Carrillo in a paper read before the First Pan-American Congress of Neurology, Montevideo, 1944. It is suggested that these cases are the expression of acute arachnoiditis possibly due to a neurovirus. (26 illustrations, including visual fields and poorly printed fundus photographs.) W. H. Crisp.

Freeman, J. D. J. **Quinine amblyopia.** Brit. Jour. Ophth., 1946, v. 30, June, pp. 345-349.

A woman, 27 years of age, who had been given 120 grains of quinine because of malaria began to complain of deafness and black and green spots before her eyes. No more of the drug was given but in six days she began to complain of blurred vision which progressed to complete blindness in two more days. The pupils were large and fixed, the retinal arteries were constricted, the disc margins blurred, and there was one large retinal hemorrhage. Without specific treatment the vision very slowly returned to normal except for a slight defect in the lower portion of the field in each eye. Morris Kaplan.

Garcia Miranda, A. **Inverted Foster-**

Kennedy syndrome. Ophthalmologica, 1946, v. 112, Aug., pp. 72-77.

A patient is described who had temporal atrophy of the disc and central scotoma in the left eye and papillary edema with normal vision in the right. A frontal meningioma situated in the right premotor region had displaced the ventricular system in a direction diametrically opposite to the tumor and had pressed the brain against the contralateral optic nerve. This rare condition, only described once before, may be called an inverted Foster-Kennedy syndrome. (2 figures.) F. Nelson.

Guha, G. S. **A case of quinine amblyopia.** Indian Med. Gazette, 1946, v. 81, June-July, pp. 238-241.

A robust Hindu, aged 28 years, complained of tinnitus quickly followed by deafness and loss of vision after the administration of 60 grains of quinine for malaria within a period of 24 hours. The vision was reduced to light perception. The pupils were dilated and fixed, the discs very pale, the retinal arteries threadlike, and the fields were very markedly contracted. Treatment included amyl nitrite inhalations, belladonna, lumbar puncture, corneal paracentesis, and vitamins. Paracentesis gave greatest relief. The vision returned to normal but some peripheral scotoma remained. (Fields, charts.) F. M. Crage.

Humblet, M. and Weekers, R. **The diagnosis of tobacco amblyopia.** Bull. de la Soc. Belge d'Opht., 1945, no. 82, Nov. 25, pp. 53-64.

The authors have noted an increase of 3.4 percent in the incidence of tobacco amblyopia in the period of the war years, 1940-1945, compared to the period from 1930-1940. Among the 66 cases studied during the later period, certain findings were noted. The affection was bilateral and the defects were symmetrical. The scotomas were centrocecal and not pericentral. The scotomas were best found with smaller test objects. The visual defect was much greater for a red test object than for a blue test object of the same size. Occasionally the centrocecal scotomas were perceived by the patients themselves as black spots. A very careful examination is required when tobacco amblyopia exists in conjunction with other ophthalmic conditions, such as, immature cataract, senile macular degeneration, and high myopia with choroiditis. M. R. Cholst.

Koverzshenko, A. C. **Fifty cases of retrobulbar neuritis caused by methyl alcohol poisoning.** Oftal. Jour. (Odessa), 1946, pt. 2, pp. 38-42.

The following are conclusions based on clinical experience with fifty patients. The end result of methyl alcohol poisoning depends on the promptness of therapy. Repeated venesections followed by blood transfusions, and intravenous injections of normal salt, and glucose solutions are most effective. Lumbar punctures should be performed repeatedly during the first week. In the second week therapy should be directed towards arresting the incipient atrophy of the optic nerves, and should consist of hot baths and retrobulbar injections of atropine and strychnine. Inhalations of amyl nitrite twice daily for 15 days are of value early in the disease but later they are ineffective. Vitamin B should be used. The prognosis is poor when the initial loss of vision remains without improvement for a long time. Patients with optic atrophy caused by methyl alcohol should remain under ophthalmologic observation for a long time.

Improvement of the peripheral field has followed energetic therapy in patients treated two months after the ingestion of methyl alcohol.

Ray K. Daily.

Moore, D. F. **Nutritional retrobulbar neuritis.** Lancet, 1946, v. 2, Aug. 17, pp. 246-248.

Retrobulbar neuritis has been one of the most common nutritional diseases in prisoners-of-war and internees in the Far East. The most outstanding deficiencies were those of the vitamin-B complex. Thiamine, though it could cure and prevent beriberi, could neither prevent nor cure the neuritis. Decreased visual acuity is the most common complaint, and partial optic atrophy the commonest fundus finding. Because of the variation, the term "nutritional optic neuropathy" is used. Marmite and dried brewers yeast, were used therapeutically and were effective if used early and in large doses. The neuritis can be differentiated from beriberi, though it can be associated with it. (3 figures, references.)

Bennett W. Muir.

Morone, Giuglio. **A typical craniofacial dystocia associated with atrophy of the optic nerve.** Arch. di Ottal, 1946, v. 50, March-April, pp. 45-73.

Morone describes one case of Crouzon's disease, with bilateral optic atrophy. The signs were typical except that the strabismus in this patient was convergent and not divergent. Many other associated lesions have been reported: chorioretinitis, increased tortuosity of vessels, retinitis, pigmentosa, retinitis proliferans, and congenital cataract. The one common ocular finding is the optic atrophy, usually of a gray-green color, dilated sinuous veins, narrowed arteries, and occasionally perivasculitis.

Morone accepts the theory that the basic disturbance is in the lymphatic tissue of the rhinopharynx, in an endocrine imbalance, and in the teratomatous development described by Crouzon. He discards all other theories. The increased intracranial pressure, which is the cause of the many complications must be reduced. Repeated lumbar punctures are purely palliative. Cranial decompression has given good results when done early.

Francis P. Guida.

Scullica, F. **A primary tumor of the sheaths of the optic nerve.** Ann. di Ottal., 1946, v. 73, April, pp. 193-206.

A tumor from the orbit of an 11-year-old boy was found to be a diffuse meningioma of the pia-arachnoid of the optic nerve. The cellular elements were typical fibrillar astrocytes. The nerve, which the tumor surrounded as a muff, was normal except for moderate edema and slight degenerative changes.

Harry K. Messenger.

Seidenari, Renato. **Leucosarcoma of papilla in a luetic patient.** Boll. d'Ocul., 1945, v. 24, April-June, pp. 152-162.

A man, 58 years of age, who for about a year had noticed a progressive diminution of vision of his right eye had a visual acuity of 1/100, negative transillumination and normal intraocular tension. The fundus examination revealed a round grayish mass occupying the entire region of the disc and protruding into the vitreous for 3 mm. A previous examination had shown a positive Wassermann reaction but antiluetic treatment had not affected the mass in any way. A diagnosis of neoplasm of the disc was made and the eye was enucleated. The mass had not

extended backward through the lamina cribosa but appeared to have invaded the choroid. It proved to be a leucosarcoma. (Bibliography, 5 figures.)

Melchiore Lombardo.

Weekers, L. **The pathogenesis of nicotine-alcohol optic neuritis.** Revue Bulgare d'Opht., 1943, v. 2, pp. 161-166.

Three factors influence the course of a toxic retrobulbar neuritis. The impairment of the general health, caused by an insufficient diet, the toxic effect of the nicotine, and alcohol which lowers the general and local resistance and sensitizes the nerve elements to the effect of nicotine.

Alice R. Deutsch.

White, J. P., and Lowenstein, A. **Unpigmented primary tumor of the optic disc.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 253-260.

For two and a half years the authors observed a growing, nonpigmented tumor of the disc in a boy nine years of age. They considered the tumor a blastoma or a phakoma and since these could not be differentiated entirely from glioma, the eye was removed. The tumor consisted of a mass of foamy cells which had infiltrated the surrounding retina and had caused a cavernous degeneration of the optic nerve. Their final diagnosis was phakoma, which is a malformation developing from those undifferentiated neuroectodermal cells that are normally destined to become glial or ganglionic cells. (7 illustrations.)

Morris Kaplan.

Wright, E. J. **Nutritional optic neuropathy.** Lancet, 1946, v. 2, Sept. 14, pp. 401-402.

The syndrome of epithelial and nervous lesions complicated by nutritional optic neuropathy was first recognized by H. Strachan in 1897. Multiple neuritis, trophic scattered skin lesions, and neuritis of the special sense nerves were described. Wright named vitamin A and D deficiency as the cause in 1927. Clark in 1936 concluded that cyanogenic foodstuff, a common factor in the diet of all sufferers of pellagra and allied nutritional diseases, produced a slow prussic acid poisoning. Hobbs and Forbes in 1946 suggested the prophylactic value of first-class protein; which contains much sulphur, as an antidote for cyanogenic food. The author describes his sulphur therapy in this syndrome. Francis M. Crage.

12

VISUAL TRACTS AND CENTERS

André-Van Leeuwen, Maria. **Clinical manifestations of pupillotonia.** Ophthalmologica, 1946, v. 111, June, pp. 339-350.

To investigate the hereditary background of four patients with tonic pupils, one with a tonic pupil after internal ophthalmoplegia, and another with a complete Adie's syndrome the author individually examined 63 persons.

There were no other cases of pupillotonia or areflexia in any other member of the families of the afflicted persons but there was a comparatively frequent incidence of hippus, anisocoria, slowing of the accommodation—convergence reflex, and changes in the form of the pupil. Congenital hereditary afflictions of the nervous system were entirely absent. There were many angioneurotic manifestations. Three family members and two afflicted persons who were more than 45 years of age had signs of herpes zoster, a coincidence also noticed by other investigators. (References.)

Alice R. Deutsch.

Franceschetti, A. and Bischler, V. **Pharmacodynamic effects on the pupillotonia and accommodotonia in Adie's symptom.** Revue Bulgare d'Opht., 1943, v. 2, pp. 85-89.

Mecholyl in 2.5-percent solution which does not change the size of a normal pupil, causes contraction of the pupillotonic pupil in a remarkable way and diminishes the latent period of accommodation. Prostigmine causes temporary impairment of the pupillary function and of accommodation. Daily doses of quinine improved the accommodation.

Studies of these reactions in two patients are described. The possible connection of the pupillotonia with the myasthenia gravis and myotonic dystrophy are discussed.

Alice R. Deutsch.

García Míranda, A. **A reversed Foster-Kennedy syndrome.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Sept., pp. 737-742.

Two cases of frontal lobe tumor with chocked disc on the side of the tumor, and a central scotoma on the opposite side are reported. Ventrilography showed contralateral distension of the ventricles, which explains the compression of the optic nerve. The central scotoma on the side of the tumor is explained by the greater vulnerability of the papillo-macular bundle. (2 illustrations.) Ray K. Daily.

Garcia Ochoa, R., and Etchemendigary, A. N. **Atypical Adie's Syndrome.** Anal. Argent. Oft., 1945, v. 6, Oct.-Nov.-Dec., pp. 133-143.

A man, 41 years of age, is presented who had a primary syphilitic lesion some years ago, and whose blood serum reactions are negative at present. Vision was normal in each eye as were the motor status and fundi. A definite anisocoria was present, with the right pupil larger than the left. The pupil did not react to mild light stimuli, but after a latent period reacted slowly and forcefully to light, even after it had been removed. Kneejerks were absent. A complete discussion of the literature is given. The diagnosis must differentiate this lesion from myelitis, meningitis, arteriosclerosis, syringomyelia, and tertiary syphilis. The disease is benign. (Bibliography.) Edward Saskin.

Lodge, W. O. **Bitemporal hemianopia.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 276-281.

Brief case reports of three patients with pituitary tumors and bitemporal hemianopia are presented. All three were operated upon with immediate good results though two died of recurrence. (2 colored plates.)

Morris Kaplan.

Longhena, L., and D'Ajutolo, F. **Opticochiasmatic arachnoiditis.** Riv. Oto-Neuro-Oft., 1946, v. 21, Jan.-Feb., pp. 1-42.

The writers report a clinical and surgical study of ten cases of opticochiasmatic arachnoiditis in which surgery was done in the eye department of the University of Bologna. The diagnosis is based almost exclusively on the ocular symptoms: the reduction of vision, the changes in the visual fields, and the changes in the fundus. Under local anesthesia craniotomy by the right transfrontal route was performed and the optic nerves and the chiasm were freed of pathologic adhesions. The ages of the patients ranged from 18 to 54 years. Seven patients were males. The Wassermann reaction was positive in one, symptoms of tuberculosis of the lungs were present in an-

other, nasal and paranasal symptoms were present in two, and chronic alcoholism in one patient. In six patients there was good and permanent improvement, in two the ocular condition remained stationary and two died. The outcome is most favorable in recent inflammations and in those of slow evolution. Neuro-surgical therapy is the treatment of choice. Medical treatment was of no avail. (Bibliography and 20 figures.) Melchiore Lombardo.

Love, J. G., and Rucker, C. W. **Recovery from blindness following removal of suprasellar epidermoid.** Proc. Staff Mtgs. Mayo Clinic, 1946, v. 21, May 15, p. 193.

A man, forty-five years of age, presented himself with complete blindness in the left eye. There were only two nasal islands of vision in the visual field of the right eye. Despite the absence of roentgenographic confirmation, a craniotomy was performed and a suprasellar epidermoid cyst was removed. A surprising recovery of vision took place, and after three years, the visual acuity had increased to 6/30 and 6/6, although there was persistent bitemporal hemianopsia. Benjamin Milder.

Mazzini-Rizzo, Ercole. **Two cases of opticochiasmatic arachnoiditis treated surgically.** Riv. Oto.-Neuro.-Oft., 1942, v. 19, no. 1, pp. 22-48.

One of these extensively studied patients had been suffering from a syphilitic opticochiasmatic arachnoiditis. In the other differential diagnosis was somewhat difficult because of signs of intracranial tumor. In both, surgery confirmed the diagnosis of opticochiasmatic arachnoiditis. In the syphilitic patient one eye became blind in spite of surgery and intensive antiluetic treatment. The other patient retained some vision in both eyes for four years. Preservation of vision can only be expected if surgery is performed at an early stage. (7 figures.)

K. W. Ascher.

Pendergrass, E. P., and Perryman, C. R. **Opticochiasmatic arachnoiditis.** Am. J. Roent., 1946, v. 56, Sept., pp. 279-298.

Opticochiasmatic arachnoiditis produces a syndrome similar to that produced by a tumor in the region of the optic chiasm. It may result from syphilitic meningitis, mastoiditis, sinusitis, petrositis, chronic rhinopharyngitis, encephalitis, multiple sclerosis, and tuberculosis. The arachnoid is thickened, grayish, opalescent, and may contain cysts. The optic nerves and chiasm are atrophic and are usually enmeshed in adhesions. Patients complain of loss of vision in one or both eyes and headache that is usually frontal. The optic discs may be normal, but more often are atrophic and ten percent of patients have papilledema. Central scotoma, concentric contraction and temporal loss are the most common field defects. Diagnosis is made by air encephalography. Ten cases are reported. (24 figures.) I. E. Gaynon.

Seidenari, Renato. **Craniopharyngioma in an adult patient with a choked disc.** Riv. Oto-Neuro-Oft., 1941, v. 18, no. 4, pp. 293-299.

A 26-year-old female patient developed a central scotoma for white and for colors in the right eye and a relative central scotoma and a complete temporal paracentral hemianopic scotoma in the left. Ophthalmoscopy revealed a choked disc in the right eye and a postneuritic optic nerve atrophy in the left. A suprasellar tumor was diagnosed after ventriculography, and

surgery resulted in removal of a suprasellar prechiasmic craniopharyngioma.

E. W. Ascher.

Whitten, R. H. **Scotoma as a complication of decompression sickness.** Arch. of Ophth., 1946, v. 36, Aug., pp. 220-224.

Forty-one medical students were exposed a total of 100 times to lowered barometric pressure in a decompression chamber that was equivalent to ascents to simulated altitudes of 35,000 and 38,000 feet (10,600 to 11,500 meters). Pure oxygen was supplied for altitudes above 10,000 feet (3,000 meters). Twenty-eight men on 37 ascents suffered from decompression sickness. Ten men on 18 of 34 ascents manifested various visual symptoms or headaches. Five men on 7 of 11 ascents manifested scotomas. The scotomas were of a bilateral homonymous, incongruous type with macular sparing, peripheral drifting, and continuity across the vertical midline. Identification of the causative lesion is not at present possible.

John C. Long.

13

EYEBALL AND ORBIT

Brognoli, Carlo. **Intermittent exophthalmos, probably from a sympathetic lesion simulating the picture of angioneurotic edema of Quincke.** Arch. di Ottal., 1946, v. 50, March-April, pp. 74-96.

Brognoli describes and discusses in great detail the experience of a woman, 20 years of age, who had recurrent edema of the lids and exophthalmos for several months. The lids of the right eye had a non-inflammatory, non-pitting edema and the eye was displaced moderately forward and slightly laterally. Ocular motility was normal. There was no pulsation or bruit. In the fundus there was edema of the disc and retina, dilatation and tortuosity of the vessels, and no hemorrhage. The left eye was externally normal and there was slight edema of the nasal border of the optic disc. Vision was 0.2 and 0.7 in the right and left eye respectively.

About the twenty-fourth day after admission the patient developed severe headache and later became irrational and convulsive. Because of obstructed breathing a rhinologic examination was done and hypertrophy of the right middle turbinate was noted. The turbinate was removed. Within three days the edema and the exophthalmos had disappeared. The fundus and the vision slowly returned to normal. The symptoms had not recurred after four months.

Brognoli believes that the middle turbinate stimulated branches of the sphenopalatine ganglion.

Francis P. Guida.

Brown, A., and Harper, R. K. **Craniofacial dystosis; the significance of ocular hypertelorium.** Quart. J. Med., 1946, v. 15, July, pp. 171-182.

The author differentiates the chief types of craniofacial dystosis. Among them hypertelorism is a deformity associated with undue separation of the orbits. It is present in infancy, persists throughout life, and is usually bilateral. Mental defects may be present. Patients usually have strabismus and defective visual fields. Binocular vision is considerably impaired for near. The history and literature is reviewed and the author presents two families in which the condition was present in three generations. Orwyn H. Ellis.

Capus, B. **Clostridium welchii pan-**

ophthalmitis. Arch. of Ophth., 1946, v. 36, Aug., pp. 226-228.

A soldier was injured by the explosion of a wooden land mine that produced lacerations of the face and a puncture wound of the left eye. He was promptly given penicillin and sulfadiazine. In spite of this medication the eye became immobile, proptosed and extremely tender. There was no light perception. Pressure on the cornea resulted in a gush of coffee-colored exudate and gas with a characteristic odor. Evisceration was performed, and within the liquefied necrotic contents was found an irregular piece of wood. The same coffee-colored exudate was found in the facial wounds. Smears and cultures from the eye revealed a gram-positive bacillus with all the cultural and morphologic characteristics of Clostridium welchii. All signs of systemic effects of the toxin ceased after the patient was given 180,000 units of tetanus-gas gangrene antitoxin intravenously. John C. Long.

Cristini, Giuseppe. **Ocular changes in experimental hypoglycemia.**. Riv. di Oftalm., 1946, v. 1, March, pp. 156-179.

Five female guinea pigs, weighing between 600 and 800 grams each, were used for insulin experiments. They received doses ranging between 40 and 200 units and a total of 400 to 2,000 units of insuline. The blood sugar values after observation of two to fifteen convulsions, were 0.70 to 0.35. The method used for blood sugar determination was that of Crecelius and Seifert. During the hypoglycemic attacks the pupils were markedly dilated and failed to react to strong light. Intraocular pressure decreased during these attacks and became very low before the animals died. The corneal microscope revealed no changes of the corneas nor of the anterior chambers although a slight hyperemia of the iris vessels was obvious. About two hours after the administration of the drug, a slight opacification of the anterior suture lines of the lens was noticed. High-power biomicroscopy showed finest striation originating at right angles from the suture lines. At this stage the lenses appeared opalescent; with progressing intoxication, they assumed a milky appearance which showed some regression when, after glucose administration, the animals were brought back to normal blood sugar levels. Small cortical opacities that developed later on between the anterior discontinuity zones, proved to be irreversible after glucose administration. In one of the animals, a transient change of the anterior lens grain was observed. If the animals succumbed, they were used for histologic examinations. Vascular as well as parenchymatous changes were observed in the organs and severe retinal, choroidal, and optic nerve affections were encountered. The possible mechanism of the pathogenesis of these alterations and those of the lens is discussed. The lenticular changes seem to result from anoxia. (Bibliography.)

K. W. Ascher.

De Leonibus, F. **Histologic study of the ocular and orbital metastases of the transplantable malignant lymphosarcoma of fowls.** Ann. di Ottal. 1946, v. 73, April, pp. 207-216.

This tumor, discovered by Pentimalli and described by him in 1940, has many resemblances to lymphatic leukemia and sarcomas. When inoculated in the pectoral muscles of fowls there is metastatic dissemination and proliferation of the cells in the orbital and ocular tissues. The lacrimal gland was a favored site for massive infiltration. Transplants

thrive in the anterior chamber and spread through the sclerocorneal trabecula along the arteries and veins to the subconjunctival tissue and invade the vascular tunic of the globe.

Harry K. Messenger.

García Miranda, A. **Fibroma of the orbit.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Sept., pp. 759-767.

The literature is reviewed and a fibroma in the left orbit of a 25-year-old man is reported. The tumor was extirpated and recovery was uneventful. (4 photographs, 2 microphotographs.)

Ray K. Daily.

Goldmann, H. **Reconstruction of a socket for prothesis. (Höhlenplastik.)** Ophthalmologica, 1944, v. 107, Jan. Feb., p. 60.

After removal of all conjunctival remnants and dissection of the skin and external canthus to the bony margin of the orbit an impression of the socket is made with pliable "Kerr Masse." A Thiersch flap from the thigh is wrapped around this moulage and put in place. Adaptation of the lids follows. The external canthus is reconstructed in a second operation, one week later, followed by the reconstruction of the fold of the upper lid (ptosis operation after Elschnig). Max Hirschfelder.

Jona, Sergio. **Direct and indirect orbital fractures radiating into the optic canal.** Riv. Oto-Neuro-Oft., 1942, v. 19, no. 1, pp. 49-69.

Among seven meticulously observed patients suffering from either direct or indirect fractures of the bony orbit, none showed any fifth nerve lesion, amazingly few extraocular muscle involvement, and only one had enophthalmos. In five patients, a descending optic nerve atrophy occurred, causing total irreparable blindness; two remaining patients developed hemianopia. The author considers severe contusion of the nerves to be responsible for the pathogenesis of the nerve lesions. In patients with initially well preserved visual function, later formation of a bony callus may cause a final loss of vision. (Six X-ray photographs, bibliography.) K. W. Ascher.

Kalfa, S. F. **A case of pulsating traumatic enophthalmos.** Oftal. Jour. (Odessa), 1946, pt. 2, pp. 15-18.

Kalfa reports a case of fracture of the orbit with separation of the fragments in the superior external portion of the orbit that resulted in pulsating enophthalmos and ptosis. There was no aneurismal bruit or dilatation of the ocular veins. The pulsation of the eyeball was very pronounced and was synchronous with the pulse. The enophthalmos is attributed to the separation of the fragments in the superior orbital wall and a recession of the orbital fat towards the cranium. The pulsation is believed to result from transmission of the pulsation of the brain through the defect in the orbit. Tenotomy of the four rectus muscles was without effect on the enophthalmos. Ray K. Daily.

Marin Amat, M. and Marin Enciso, M. **Colobomatous cyst and microphthalmos.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, July, pp. 566-578.

One more case of colobomatous cyst and microphthalmos is added to the literature of ophthalmologic teratology. It occurred in an infant, twelve days of age, whose left eye was normal. A detailed anatomic study of the malformation is reported. (7 illustrations.)

J. W. McKinney.

Massoud, F. **Proptosis-differential diagnosis.** Brit. Jour. Ophth., 1946, v. 30, Oct., pp. 622-630.

For purposes of differential diagnosis, cases of proptosis are divided into six categories. 1. Apparent—as in myopia and buphthalmos. 2. Congenital anomaly—as in shallow orbit and cranial hernia. 3. Trauma—as in cavernous sinus thrombosis and arteriovenous aneurism. 4. Inflammatory process. 5. New growths. 6. Systemic conditions—as in hyperthyroidism and hyperplastic blood dyscrasias. The author presents eight case reports very briefly.

Morris Kaplan.

Ortin, L. G. **Orbital hemorrhages in early infancy.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, March, pp. 227-237.

Two cases of large subperiosteal hemorrhage in the outer portion of the orbit, in infants under two years of age are reported. There was a vague history of trauma in each and both recovered completely under large doses of vitamin C. A vitamin C deficiency is the probable etiology.

Ray K. Daily.

Sédan, Guiral, and Reinhard. **Sebaceous orbital cyst associated with a large lacuna of the craniofacial skeleton that suggested a meningocele or even an encephalomeningocele.** Ophthalmologica, 1946, v. 112, Aug., pp. 57-62.

In 1934, Sédan observed a small nasoörbital meningocele with a very large gap in the skull. The X-ray picture appeared in the radiological Atlas of Hartmann. The author, in collaboration with Guiral and Reinhard saw a second, radiologically identical case with a genuine nasoörbital hole, in a little girl with a congenital orbital sebaceous cyst, not of a dermoidal character. Its removal was successful.

Despite the different nature of the conditions two X-ray pictures were identical. (2 X-ray plates.)

F. Nelson.

Tolosa, E., and Gospert de Ignacio. **Fronto-orbital multiocular cyst, lined with respiratory mucous membrane.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 840-855.

A case of mucocele of the right frontoethnoidal sinus extending into the cranium in a woman, 45 years of age, is reported. The ocular symptoms were unilateral exophthalmos, displacement of the eyeball down and out, and involvement of the first, second, and third cranial nerves on the diseased side. The patient also had symptoms of increased intracranial pressure, and epileptiform attacks. The radiographic studies were suggestive of a dermoid. The neoplasm was extirpated through craniotomy and was found to consist of a multilocular mucocele, lined with respiratory mucous membrane and filled with a sterile mucopurulent material. The literature on mucoceles extending into the cranium is reviewed.

Ray K. Daily.

Tristaino, L., and Jannetti, D. **Orbital empyema following dacryoethmoiditis and pansinusitis.** Riv. Oto-Neuro-Oft., 1941, v. 18, Nov.-Dec., pp. 475-489.

Orbital abscess followed dacryocystectomy in a patient suffering from pansinusitis. The authors stress the possible spread of inflammatory processes from the lacrimal sac to the ethmoid, and vice-versa; abnormally extensive pneumatization may favor the

propagation of the disease to all of the nasal sinuses. K. W. Ascher.

Welti, H., and Offret, S. **Malignant exophthalmos. Its surgical treatment.** Rev. Oto-Neuro-Oft., 1946, v. 21, Jan.-Feb., pp. 7-15.

This type of exophthalmos, not due to retrobulbar neoplasm, is so serious as to warrant surgical intervention in order to prevent grave trophic corneal alterations or damage to the visual pathway. The surgical technique described has as its goal the reduction of retrobulbar edema and the establishment of physiologic drainage. It is essentially a subcutaneous decompressing trepanning of the anterior portion of the temporal fossa. Results have been anatomically satisfactory with improvement in visual acuity. (10 illustrations.) Edward Saskin.

Wolpaw, B. J. **Orbital hemorrhages following pressure on neck.** U. S. Naval Med. Bull., 1945, v. 46, Sept., pp. 1469-1471.

A sailor was rendered unconscious for 30 seconds by application of neck pressure, in a "strangle-hold." Hemorrhages of lids, conjunctivae and orbit were noted immediately thereafter. The remainder of the eye examination and capillary fragility tests were normal. There were no signs of cerebral injury. Benjamin Milder.

14

EYELIDS AND LACRIMAL APPARATUS

Arruga, H. **The form of lacrimal probes.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Nov., pp. 943-948.

After a criticism of the lacrimal probes in use, Arruga describes his probes, which are bayonet-shaped, and similar to the Ziegler probes, except that their lower end is 22 mm. instead of 35 mm. long. These do not impinge on the superciliary ridge, and do not press on the bone. (8 illustrations.) Ray K. Daily.

Bangerter, A. **Contribution to the diagnosis and therapy of lacrimation.** Ophthalmologica, 1944, v. 107, Jan.-Feb., pp. 51-54.

Systematic examination of the lacrimal canaliculus and the tear sack is indicated whenever the fluorescein test is negative. Positive irrigation of the sack after minimal introduction of the canula (just passing the tearpoint) indicates an abnormal position of the punctum or its stenosis. If it is impossible to irrigate the sack after this short introduction, an obstruction of either the canaliculus itself or of the tear-sack must be assumed. The differential diagnosis concerns the location or the type of such an obstruction and is made by passing the canula forward with a further trial of irrigation. Probing, and injections of privine, which produces shrinkage of the mucous membrane, complete the investigations. Valve formation within the canaliculus is treated with electrocoagulation and a residual probe for a few days. A stenosis of the canaliculus or the duct is sometimes cured by repeated probing with introduction of a temporary rubber band. The author recommends dacryocystorhinostomy for patients who cannot be benefited by these conservative methods. Max Hirschfelder.

Barraquer, T. **Internal fistula of the lacrimal sac.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 896-897.

A three-year-old child with a phlegmon of the lacrimal sac and intense pericystitis was treated by an

incision into the lacrimal sac, evacuation of pus, and packing. In packing it was noticed that the cavity was very deep. By irrigation with mercurochrome it was demonstrated that the sac opened into the nose. When healed there was a larger lacrimonasal communication than normal.

Ray K. Daily.

Barraquer, T. **The preliminary staining of the lacrimal sac in operations on the sac.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 884-886.

Barraquer injects a five-percent fresh aqueous solution of methylene blue into the lacrimal sac just before extirpating it. A few moments before beginning the operation, pressure over the sac expells the dye, leaving its wall stained. Failure to do so leads to staining of the entire operative field as soon as the sac is opened. With the excess solution expelled the walls of the sac stand out in dark contrast, and total extirpation is facilitated. Ray K. Daily.

Gonzales, J. B. **Dacryostomy in industrial accidents.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 887-895.

The author presents tabulated data on the results in 28 cases of extirpation of the lacrimal sac, and 48 cases of dacryocystorhinostomy, performed as a part of the therapy of traumatic corneal ulcers. The data clearly show the superiority of dacryocystorhinostomy. The final visual acuity is better and the course of the corneal infection is shortened. Ray K. Daily.

Guelbenzu, M. D. **A contribution to dacryocystorhinostomy. A continuous suture of the anterior mucous membrane flap.** Arch. de la Soc. oft. Hisp.-Amer., 1945, v. 5, Nov., pp. 949-964.

Anesthesia, skin incision, trepanation, and formation of the mucous membrane flaps do not differ from the customary type. For enlarging the lacrimo-nasal opening the author devised a trephine which works rapidly without danger of injurying the nasal mucosa. The posterior flap is sutured in the customary manner; the anterior flap is sutured with a continuous silk suture, which can be removed without traumatizing or disturbing the flaps. The ends of the suture come out thru the skin, on the nasal side of the incision, and a central loop is held against the nose with adhesive plaster in such a way that the anterior mucosal flap is pulled forward. (7 illustrations.)

Ray K. Daily.

Guyton, Jack S. **A simple method of removing eyelashes by electrolysis.** Amer. Jour. Ophth., 1947, v. 30, Jan., pp. 57-58.

Knapp, P. **Treatment of blepharoclonus with injection of alcohol.** Ophthalmologica, 1944, v. 107, Jan.-Feb., pp. 63-66.

Severe blepharoclonus can be remedied with injections of 1 to 2 c.c. of 70-percent alcohol. The injection is preceded by local anaesthesia and 2-percent novocaine solution 15 minutes before the alcohol injection into the orbicularis muscle. Hot compresses are recommended. Usually, five to eight injections were necessary and recurrences were frequent. However, they could be suppressed by more alcohol injections. Of 26 patients 24 responded to this treatment. Most of the patients were over 60 years of age.

Max Hirschfelder.

Marin Amat, M. and Marin Enciso, M. **Treatment of ectasia of the lacrimal**

sac by partial resection of its anterior wall. Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, Aug., pp. 822-827.

The authors advocate resection of the anterior lacrimal wall with forcible dilatation of the nasolacrimal opening as a simpler procedure and just as effective as extirpation of the lacrimal sac or dacryocystorhinostomy. The sac is exposed as for dacryocystorhinostomy. After excision of the anterior wall of the dilated sac a number 5 or 6 probe is passed into the nose through the lacrimo-nasal opening. The walls of the sac are sutured with a continuous heavy slik suture, the ends of which are passed through the skin, and tied over beads. Suture of the skin incision and irrigation of the lacrimal sac to insure its permeability completes the operation. Acute infection and impermeability of the lacrimo-nasal opening are contraindications. As the last point is not predictable, the authors suggest that every surgical approach in chronic ectasia be begun as this procedure. It can be converted to an extirpation of the sac or a dacryocystorhinostomy, as the indications for these procedures become apparent during the operation. Ray K. Daily.

Marin Enciso, M. **Bilateral hysterical pseudoptosis.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, April, pp. 357-360.

Hysterical pseudoptosis is in reality not a ptosis, but a spasmodic blepharospasm. It is usually monocular; bilateral involvement is very rare. A woman, 39 years of age, with an irrelevant history, and without neuropathic antecedents in the family, developed a bilateral inability to open the eyes. There were no folds in the lids or forehead, position of the eyebrows was normal and there was resistance to having the lids lifted by the examiner. The patient was cured by injection of novocain and alcohol into the outer canthi with the assurance of a cure. The author stresses the importance of coupling suggestion with objective therapeutic measures, to which the patient and the family may attribute the cure. A very dogmatic behavior on the part of the physician may lead to failure. Ray K. Daily.

Moreu, A., and Fornes, E. **A case of epithelioma of the lachrymal gland.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, Jan., pp. 59-63.

A tumor of the lachrymal gland was excised and two months later it recurred at the orbital margin. Excision of the recurrent nodule was supplemented by irradiation, with no further recurrence. Histologic examination revealed an epithelioma of low malignancy. (2 microphotographs.)

Ray K. Daily.

Rintelen, F. **The therapy of lachrymation.** Ophthalmologica, 1944, v. 107, Jan. Feb., pp. 32-42.

This paper classifies the causes of lacrimation. They may be hypersecretion of the tear gland, anomalies of the position of the lids and stenosis of the lachrymal duct. The physiology of the lachrymal apparatus and the various means for correction of pathologic changes are discussed.

Max Hirschfelder.

Spaeth, E. B. **Blepharoptosis.** Trans. Amer. Acad. Ophth. and Otolaryng., 1946, March-April, pp. 142-162.

Approximately 100 patients with blepharoptosis who were examined and treated by the author during a 20 year period are classified and analyzed surgically.

Congenital ptosis is classified as follows: 1. Unilateral ptosis without superior rectus involvement (40 percent); 2. unilateral ptosis with involvement of homolateral superior rectus (21 percent); 3. bilateral ptosis without superior rectus involvement (7 percent); 4. bilateral ptosis with bilateral superior rectus involvement (8 percent); 5. unilateral ptosis with weakness of both superior recti, but more marked in homolateral eye (2 percent); 6. ptosis with more or less complete third nerve and even with sixth nerve paralysis (9 percent); 7. ptosis with classical jaw-winking reflex (3 percent); 8. ptosis with Duane retraction syndrome (2 percent); 9. ptosis with neurofibromatosis (10 percent).

Acquired or symptomatic ptosis is etiologically and anatomically classified as follows: 1. traumatic peripheral; as in sectioning of the levator, in cicatrization, in osteomyelitis, after blepharoplasty, and after reconstruction of a socket; 2. traumatic, central and cerebrospinal; in 3rd nerve paresis or paralysis, and cervical sympathetic paralysis due to nerve section; 3. neoplastic or inflammatory peripheral; 4. atonic; senility and blepharochalasis, and after simple enucleations; 5. neuromuscular disturbances; myasthenia gravis, myasthenia of thymic tumors, ophthalmoplegias of thyrotoxicosis; 6. ptosis of cervical sympathetic involvement; Horner's syndrome; 7. ptosis of third nerve lesions; 8. ptosis with pseudo-Graefe syndrome; 9. hysterical ptosis.

Congenital ptosis in classes 1, 2, 4, and 5, and occasionally 9 is usually best corrected by a levator advancement with a partial tarsectomy. Those of class 3 are ideal for the Motais-Parinaud technique. Ptosis in class 6 and those in 1, 2, and 4, which are accompanied by completely paralyzed levators is best corrected by the techniques of Gifford, Hunt-Tansley, or Reese in which fibers of the orbicularis are transplanted. In patients in class 6 extraocular muscle surgery should be done before correcting the ptosis. Those in classes 7 and 8 are corrected by tenotomy with tenectomy of the levator (resection without reattachment) and later a Reese transplant of the orbicularis fibers to the occipitofrontalis. Those in class 9 are corrected by the Hess technique.

In acquired ptosis in class 1 the levator is used if not severed. When the levator is severed, the occipitofrontalis is used. In patients in class 3 the underlying orbital condition should be corrected before correcting the ptosis. For ptosis in class 4 a levator resection with resection of the atonic skin is indicated, and the skin should be quilted to the anterior surface of the tarsal plate. Ptosis in myasthenia gravis is not a surgical problem; removal of a thymic tumor corrects the ptosis in thymic myasthenia; thyrotoxic ptosis usually requires an orbicularis transplant. In ptosis of class 6 a levator advancement by the transconjunctival route is indicated. In classes 2 and 7 surgery for oculomotor paralysis should precede the use of orbicularis or fascia lata transplants to utilize the occipitofrontalis. In class 8 a levator myectomy and tenotomy is indicated; surgery for the accompanying ocular paralyses may then be done. For ptosis of class 9 no surgery is indicated.

The occipitofrontalis, the superior rectus if normal, and the levator may be used surgically. Levator advancements demand a partially intact levator, and may be done after the second year of life. Superior rectus utilization on the Parinaud-Motais principle, is never

done unilaterally; the Kirby and Shoemaker modifications are best. Bilateral levator or superior rectus surgery should be done on both eyes at the same time and not before the third year of life. Ptosis in infants, especially when bilateral, should be operated upon early; crutch glasses may be used beforehand. Crutch glasses are of especial service in complete external ophthalmoplegias.

A chart of the several types of ptosis and their surgical indications is presented. Charles A. Bahn, M.D.

Verzella, Mario. **Malignant neoplasms of the Meibomian glands.** Riv. di Oftalm., 1946, v. 1, March, pp. 189-212. (See Section 15, Tumors.)

15

TUMORS

Ajo, Aarni. **A case of chondroma bulbi.** Brit. Jour. Ophth., 1946, v. 30, Aug., pp. 465-470.

A 19-year-old Finnish sailor complained of pain, redness and dimming of vision for two years in an eye in which the vision had been poor since early childhood. As long as the patient could remember he had had two tumors in the conjunctiva. Examination revealed a nearly blind eye with two discrete cylindrical tumors under the conjunctiva that extended up into the upper fornix and into the stroma of the opaque cornea. Biopsy revealed a true hyaline cartilage tumor intimately mixed with lacrimal gland tissue. Enucleation was refused but the patient returned in a year when the tumors had grown appreciably. This growth seemed malignant but surgery was again refused. (6 illustrations.)

Morris Kaplan.

Bertoldi, Maria. **Adenoma of the Meibomian glands.** Rassegna Ital. d'Ottal., 1941, v. 10, March-April, p. 211.

A tumor was seen in the left lower lid of a 43-year-old woman two years before its complete removal. It had originally been treated as a chalazion and partially removed three times before. The histologic preparation showed a characteristic picture of an adenoma of the Meibomian glands. This benign tumor is less frequently seen than the epithelioma. (3 figures.) E. M. Blake.

Bonnet, P. **A diffuse hyperplastic papillomatous tumor of the cornea, originating from an old pannus.** Revue Bulgare d'Opht., 1943, v. 2, pp. 44-54. (See Section 6, Cornea and sclera.)

Di Ferdinando, R. **An angiomixosarcoma of the choroid arising in the stump of an exenterated globe.** Rassegna Ital. d'Ottal., 1941, v. 10, March-April, p. 182.

A 52-year-old woman first observed loss of sight in the right eye at the age of 16 years. Eight years later the eye was blind and troublesome and enucleation was advised and refused. After the lapse of another five years an exenteration of the globe was performed and a good motile stump resulted. No further symptoms were observed for eight years when the shrunken eye gave pain and a fungating mass gradually developed. This was removed and the histologic examination revealed an angiomixo-sarcoma. (9 figures.)

E. M. Blake.

Moreu, A., and Fornes, E. **A case of epithelioma of the lacrimal gland.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, Jan., pp. 59-63.

(See Section 14, Eyelids and lacrymal apparatus.)

Sykes, E. M. **Interstitial irradiation therapy in carcinoma, originating at the limbus.** Texas St. J. Med., 1946, v. 42, Oct., pp. 376-380.

Radon seeds were implanted between the sclera and conjunctiva and sutured into position there in patients with primary squamous celled epithelioma at the limbus. In one there has been no recurrence after five years and after one year in the other.

The radium element seed or tube is described and notes are given on how to use it on the eyeball.

Francis M. Crage.

Verzella, Mario. **Malignant Neoplasms of the Meibomian Glands.** Riv. di Oftalm, 1946, v. 1, March, pp. 189-212.

According to Morax, only 34 cases of carcinoma of the Meibomian glands have been described since Graefe reported the first one in 1864. Bertoldi collected 43 by 1941, and the author adds four of his own. Photomicrographs and colored pictures accompany the extensive case reports; a painstaking discussion of the characteristics of these rare tumors follows. The patients are usually more than 40 years of age and of either sex. The majority of these tumors involve the upper lid. Chalazea or simple adenomas may be the forerunners of the Meibomian carcinoma. Metastasis in lymphatic nodes has rarely been found, and generalized metastasis occurred in only eight of the published cases. Differential diagnosis in biopsies is difficult because of the lack of definite signs of malignancy in tumors of rapid growth and invasive type. In the carcinomas of the Meibomian glands, the characteristic seems to be a rapid "sebaceous maturity" which also is encountered in the metastatic tumors. Surgery with subsequent irradiation is recommended. K. W. Ascher.

White, J. P., and Lowenstein, A. **Unpigmented primary tumor of the optic disc.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 253-260. (See Section 11, optic nerve and toxic amblyopias.)

16

INJURIES

Alagna, G. **Hydrocyanic acid intoxication and the eye.** Ann. di Ottal., 1946, v. 73, April, pp. 217-233.

An eight-year-old boy died of hydrocyanic acid poisoning about twelve hours after eating some thirty apricot seeds. Ophthalmoscopic examination a few minutes before death showed diffuse edema of the retina of each eye, with a cherry-red spot at the macula; the optic disc was hazy and its margin was blurred. The ophthalmoscopic picture was on the whole very much like that of recent closure of the central retinal artery. Histologic examination showed atrophic and degenerative changes in the retina and optic nerve. The ganglion cells and nerve fibers were particularly affected. There was no involvement of the anterior segment of the eyes or of the adnexa.

The lesions in the retina and optic nerve are attributed to the direct action of the acid upon the nerve cells and their fibers. The acid acts by paralyzing the mechanisms of oxidation, with resulting asphyxia of the vulnerable third neuron.

Harry K. Messenger.

Belmonte Gonzalez, N. and Vidal Frias, J. **Localization of intraocular foreign bodies by means of the radiographic visualization of the globe with contrast substances.** Arch. de la Soc.

Oft. Hisp.-Amer., 1945, v. 5, July, pp. 558-565.

The author demonstrates the importance of the use of contrast substances to facilitate the localization of intraocular foreign bodies. This is done by using Per-Abrodil, which is injected into Tenon's capsule. It is easily done, is not expensive and not dangerous. J. W. McKinney.

Cruthirds, A. E. **Importance of sulfhydryl in the treatment of corneal and X-ray burns.** Am. J. Surg., 1946, v. 72, Oct., pp. 500-509.

In X-ray burns one is not to be concerned only with the burn but with an injury which leaves the underlying tissue devitalized. The skin contains 60-percent of the sulfur in the body. A serious or extensive burn disturbs the sulfur metabolism.

In the eye, as elsewhere in the body, all the minerals are present but potassium and sulfur predominate. Glutathione, containing -SH groups (sulfhydryl), is present in large quantity in the normal lens and is said to be essential for tissue oxidation. The cataractous lens has been found devoid of glutathione.

Over 500 cases of burns involving the eyes and adjacent areas were treated with a high concentration of sulfhydryl, a colloidal sulfur compound that stimulates epithelium. Its proprietary name is hydrosulphosol.

In an eye with extensive multiple pneumoccal corneal ulcers with hypopyon so severe that enucleation was considered, recovery promptly followed subconjunctival and parenteral application of penicillin and hydrosulphosol eye drops and packs. The author has not observed such excellent results with penicillin alone.

The drug is neither toxic nor incompatible with other drugs. When sprayed on the skin it quickly forms a dry flexible membrane which requires no other covering. The results in infected, indolent X-ray burns have been most gratifying. Francis M. Crage.

Dejean, C., and Sedan, J. **A clinical and experimental study of corneal lesions caused by indelible pencil and their treatment.** Revue Bulgare d'Opht., 1943, v. 2, pp. 75-83. See Section 6, cornea and sclera.)

Esteban, Mario. **The estimation of ocular disability in industrial injuries.** Arch. de la Soc. oft. Hisp.-Amer., 1945, v. 5, Nov., pp. 965-980.

The author discusses various methods for the estimation of visual disability after industrial accidents. He makes a plea for a standardized method, such as is used in the United States, and for a routine preëmployment ocular examination of workers. The tables for the evaluation of ocular war injuries as adopted in May 1938 is given in entirety. Ray K. Daily.

Farnarier, G. **Extraction of foreign bodies without provoking cataract.** Ann. d'Ocul., 1946, v. 179, March, pp. 163-165.

Magnet extraction of foreign bodies from the anterior part of the lens with immediate contraction of the pupil as advised by Elschnig was successfully used by the author. The miosis produces an adhesion between the iris and the anterior lens capsule which theoretically prevents aqueous from coming in contact with lens substance. The pupil at the time of operation is best dilated with a subconjunctival injection which does not interfere with eserine myosis. Obviously, the foreign substance must be small and magnetic,

located near the anterior lens capsule and be neither central nor too peripheral. Its extraction must be performed almost immediately after injury.

Chas. A. Bahn.

Guy, L. P. **Use of Berman locator in removal of magnetic intraocular foreign bodies.** Arch. of Ophth., 1946, v. 36, Nov., pp. 540-550.

Experience with the Berman Locator has demonstrated that the best foreign body work cannot be done without it. It is a portable electromagnetic device that is self-sufficient in many cases for all preoperative and operative localization of magnetic foreign bodies.

In the operating room, the Locator provides localization of pinpoint accuracy with which to check and, if necessary, to correct the roentgenologic localization previously obtained and provides information as to how much magnetic force is necessary. Its detecting element is sufficiently small for use in intraocular foreign body work and can be sterilized.

The combined use of the Locator with roentgenograms meets most of the ideal requirements for localization of foreign bodies. The roentgenogram discloses the presence of the foreign body, its dimensions and its position. The Locator tells whether it is magnetic and approximately to what degree.

As a probe approaches the site of the foreign body, the meter needle rises on the scale, and simultaneously the sound from the speaker rises in pitch. The position on the surface where the peak indication is obtained marks the precise spot for incision. The principles, care, and manner of use of the instrument are described.

R. W. Danielson.

Hughes, W. F., Jr. **The treatment of Lewisite burns of the eye with BAL.** J. Clin. Invest., 1946, v. 25, July, pp. 541-548.

When relatively small quantities of Lewisite liquid or vapor come in contact with an eye a devastating ocular lesion results. There is rapid tissue necrosis, marked conjunctival and corneal edema, and intense exudation. On contact with the moist surface of the eye, Lewisite immediately hydrolyzes with the production of an arsine-oxide and hydrochloric acid. The superficial corneal opacity produced by this acidity prevents BAL from having any beneficial effect on the eye.

Within ten minutes after exposure to Lewisite there is histological evidence of damage in all tissues of the anterior ocular segment, indicating deep penetration and rapid necrotizing action.

Over 600 rabbit eyes were exposed to Lewisite. No residual toxic material or arsenic remained on the corneal surface within two to four minutes after the instillation of the liquid Lewisite into the eye followed by the closure of the lids. A single instillation of BAL solution or ointment within two to five minutes after exposure to Lewisite, effectively prevented the development of serious ocular lesions. The excellent therapeutic effect of BAL is due, in part at least, to its rapid pentration and neutralization of toxic arsenical material in the tissues before irreversible histologic changes have developed. If treatment is delayed five minutes, the Lewisite reaction lasts a few days. If delayed 10 minutes corneal opacities are still present at the end of a week. When used within 30 minutes BAL lessens the severity of the process, but permanent damage to the eye remains. F. M. Crage.

Hughes, W. F., Jr. **Alkali burns of the eye.** Arch. of Ophth., 1946, v. 36, Aug., pp. 189-214.

This is a detailed clinical and pathologic study of the course of alkali burns, based largely on sodium hydroxide burns of the rabbit eye. During the acute stage there is ischemic necrosis and edema of the conjunctiva and limbal region of the sclera, sloughing of the corneal epithelium, histologic evidence of rapid and deep pentration of the alkali with necrosis of cells in the corneal stroma and endothelium, loss of corneal mucoid, edema of the corneal stroma and ciliary processes, and infiltration of polymorphonuclear cells into the cornea and iris.

During the reparative stage there is subsidence of conjunctival and corneal edema, regeneration of the conjunctival and corneal epithelium, vascularization of the cornea, clearing of the corneal opacification, proliferation of elongated mononuclear cells at the periphery of the burned area in the corneal stroma, regeneration of the corneal edothelium, and disappearance of the iritis.

During the stage of late complications there may be localized corneal infiltrations, progressive or recurrent corneal ulceration, overgrowth of the cornea with a vascularized membrane, permanent corneal opacification, staphyloma of the cornea, persistent or exudative iritis, glaucoma, cataract, and symblepharon.

Unlike the nonprogressive course of acid burns, alkali pentrates rapidly and deeply into the anterior ocular segment, and mucoid disappears from the involved corneal stroma. (41 photographs.) John C. Long.

Kutscher, C. F. **Ocular effects of radiant energy.** Trans. Amer. Acad. Ophth., 1946, July-Aug., pp. 230-240.

All radiations longer than 30,000 A.U. are absorbed in the cornea. A progressive increase in transmission occurs to 11,000 A.U., where 90 percent of luminous energy is transmitted through the cornea. Infrared rays of 10,000 A.U. are transmitted by the lens and absorbed by the iris. The retina receives practically none. Absorbed infrared rays raise the tissue temperature and if strong enough cause immediate thermal damage. Prolonged and severe exposure causes lens opacities that begin in the axial and posterior part. Splitting of the anterior capsule with free margins floating in the anterior chamber is the first stage of glass blowers' cataract caused by prolonged exposure to radiation of wave lengths from 10,000 to 18,000 A.U. Visible rays from 3,900 to 7,800 A.U. are transmitted through the ocular media to the rods and cones where the surplus is transformed into heat and may cause a thermal burn. The lens absorbs ultraviolet rays from 3,200 to 3,800 A.U., the cornea absorbs those below 3,200 A.U. Ultraviolet rays penetrate the tissues and may produce abiotic effects. After a latent period of six to eight hours after exposure, pain, lacrimation and corneal dullness frequently occur. Several months may elapse before gamma radiations of X ray and radium have their full effect. A disc-shaped opacity at the posterior pole of the lens surrounded by a ring of minute discrete opacities may be produced. Opacities in the capsule or beneath it may be caused by lightning and electric currents. For protection against excessive infrared rays, lenses that contain ferric oxide are of service; for excessive ultraviolet light exposure, cobalt lenses are preferable.

Leaded equipment is necessary to protect the tissues from gamma rays.

Chas. A. Bahn.

Law, Frank. W. **Minor injuries of the eyes.** Jour. of Social Ophth., 1946, v. 3, July, pp. 3-14.

The author describes the treatment of "black eye," commotio retinae, abrasion and laceration of the conjunctiva, foreign bodies, burns, and radiation injuries. Fluorescein should always be instilled to determine the extent of surface injury. The shape of the pupil and depth of the anterior chamber are the most reliable external signs of intraocular damage. Blood in the eye or a black pupillary reflex indicates a major injury. Whenever intraocular foreign bodies are suspected an X-ray examination should be made.

I. E. Gaynon.

Mathis, G. **Ocular lesions due to vapors of fluorine and its derivatives.** Rassegna Ital. d'Ottal., 1941, v. 10, May-June, p. 327.

The observations of 57 cases of palpebral and conjunctival irritation, caused by direct contact or exposure to fumes of fluorine, among 252 workers, are reported. The pathologic changes observed were simple conjunctival irritation, acute conjunctivitis, chronic catarrhal conjunctivitis, sometimes limited to the bulbar portion exposed between the lids, eczema of the lids, and three instances of bilateral pterygium. E. M. Blake.

Rebello Machado, Nicolino. **Contribution to tropical Brazilian ophthalmology.** Rev. Brasileira Oft., 1946, v. 5, Sept., pp. 5-15.

The first part of the article gives two cases of direct wasp sting in the sclera and the cornea respectively. The former was in a 12-year-old black girl. The vision of the affected eye was completely abolished. There was a severe iridocyclitis with hypopyon and diminished tension. The sting had occurred 7 mm. outward from the limbus. Later probing through the 2-mm. opening at this point suggested the presence of intrabulbar suppuration. At evisceration, the vitreous was found completely disorganized and purulent.

The second case occurred in a 34-year-old male Brazilian Negro. The cornea was stung but not completely penetrated at the five o'clock position, 2 mm. from the limbus. Vision, at first reduced to light perception, returned to normal, and only a slight nebula remained at the site of the injury. Both cases occurred along the coast, and probably both were due to the wasp Synoeca Surinana.

The second part of the paper deals with injury by toxic vegetable substances that occur especially in woodsmen, usually when engaged in cutting down trees. The most frequent offender appears to be a member of the family Euphorbiaceae, probably ophthalmoblapton pedunculare Muell, known by the local inhabitants as Cega-Miguel or Cega-Maria (Blind Michael or Blind Mary). This and similar plants possess a caustic sap or latex. Two cases are reported in woodsmen aged 23 and 34 years respectively, who had been engaged in cutting down trees in the forest, and received splashes of the sap in one eye. In each the vision, at first considerably disturbed by the effect on the cornea, returned more or less definitely to normal. Other offenders are the tree euphorbia called Uassacú, the oil of the castor plant, Podophyllin, and Jequirity. The products of these

plants are not infrequently used for simulation. (References.)

W. H. Crisp.

Stallard, H. B. **Retinal detachment due to war trauma.** Brit. Jour. Ophth., 1946, v. 30, July, pp. 419-429. (See Section 10, Retina and vitreous.)

Webster, J. E., Schneider, R. C., and Lofstrom, J. E. **Observations upon the management of orbitocranial wounds.** J. Neurosurg., 1946, v. 3, July, pp. 329-336.

A survey of 40 cases of orbitocranial wound was made. In 20 patients (Group 1) the globe was injured, requiring enucleation, and in 20 (Group 2) the bony orbit was involved with varying degrees of injury to the functions of the globe.

Patients in Group 1 required the enucleation of one or both globes, a procedure which may be done to advantage before the cranial wound is attacked. The use of implants after enucleation depended upon the degree of disorganization of the orbital contents.

Twelve patients in Group 1 presented varying types and degrees of intraocular injury with complete or incomplete loss of vision. In eight patients the vision was normal. The predominant disturbance that resulted in loss of vision was of vascular origin. The commonest findings were vitreous and retinal hemorrhages with tearing and detachment of the retina. Proptosis of the globe was frequently present with these lesions. In one patient the detachment of the pulley of the superior oblique muscle was disrupted. In another, total blindness resulted from a fragment that entered the roof of the orbit posteriorly. Evaluation of the type and degree of damage to the globe and the optic nerve by either the fragment or the concussive effects of injury was difficult to make in the early period of management.

Massive wounds of the orbitocranial wall were satisfactorily managed by means of a temporary graft of fascia lata applied to the dural defect. An osteoplastic frontal craniotomy flap exposure was effective in dealing with wounds in this area in some cases. Complicating brain abscesses were treated by an "open" method using a graft of fascia lata to close the dura temporarily and isolate the brain from the sinuses. A split thickness graft was applied to the wound after removing the temporary fascial graft.

Theodore M. Shapira.

Zolotnizki, I. I. **Perforating ocular injuries.** Oftal. Jour. (Odessa), 1946, pt. 2, pp. 25-29.

Fifteen cases are reported to show the gravity of ocular perforations associated with injuries of the skull, and the necessity for careful diagnosis before doing an enucleation, in order to avoid fatal meningitis. The author urges that every ocular perforation associated with injury to the superior orbital wall be regarded as an intracranial injury, with obligatory X-ray and neurological examination.

Ray K. Daily.

17

SYSTEMIC DISEASES AND PARASITES

Agesta, R. S. **Ophthalmomiasis with the larva of Oestrus ovis.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Sept., pp. 791-796.

Two cases are reported. In one the larvae were identified by the Institute of Parasitology, and in the other the

diagnosis was made from the history. The author believes the patients are entitled to compensation because the infection occurred while the men were at work. (2 illustrations.)

Ray K. Daily.

Bellora, Aldo. **Unilateral exophthalmos as a sign of deterioration in a case of progressive atrophic myopathy of the humero-scapular region (Erb).** Riv. Oto-Neuro-Oft., 1941, v. 18, Nov.-Dec., pp. 457-474.

A 28-year-old farmer developed exophthalmos (12-mm. protrusion) of his right eye with pseudo-Graefe, Moebius, and Stellwag signs. Gifford's sign was present, the pupils were equal and normal in all reactions. Parenteral administration of prostigmine resulted in a unilateral miosis, temporary loss of light reaction and near vision produced further pupillary narrowing. Two hours after prostigmine administration, both pupils again were equal. Progressive atrophic myopathy of the scapulo-humeral type was found. Etiology and pathogenesis are discussed. (3 figures, bibliography.)

K. W. Ascher.

Bietti, Giambattista. **Rare and atypical forms of cranial and craniofacial dysostosis with ocular complications.** Boll. d'Ocul., 1945, v. 24, April-June, pp. 83-136.

The writer reports four cases of dysostosis of the bones of the skull and face. A girl 13 years of age showed marked acrocephaly, the disappearance of cranial sutures, basilar lordosis and flattening of orbits. The digits of her hands and feet were of the Marfan type and this was present in different members of her mother's family. A symptom that she had in common with the mother was the tortuosity of the retinal vessels and with the father the myelinated fibres at the optic disc. The other three observations were made in a family among the members of which the mother, a son, and a daughter had dysostosic changes of the skull and face. The mother showed more marked lesions in the right half of the head and had exostosis of the skull. The son showed a craniofacial dysostosis of the Crouzon type and the daughter showed an atypical dysostosis with syndactyly. Three other children were free from symptoms. Among the ocular lesions common to all, the writer mentions exophthalmos, divergent strasbismus, and optic atrophy. The writer classifies the form of craniofacial dysostosis. (Bibliography, 19 figures.)

Melchiore Lombardo.

Bookstaver, P. I. **Horner's syndrome.** U. S. Naval Med. Bull., 1946, v. 46, April, p. 567.

The author describes a classical Horner's syndrome, noted within 24 hours after the patient was wounded by a Japanese bullet that penetrated the right side of the neck. There was also a bruit in the neck which suggested a traumatic arteriovenous aneurysm.

Benjamin Milder.

Cavara, Vittoriano. **The ocular manifestations of herpetic infection.** Boll. d'Ocul., 1946, v. 25, Jan.-June, pp. 3-296.

The subject is comprehensively discussed in 13 chapters: 1, the generalities of herpetic infection, 2, herpetic manifestations in the eye in general, 3, herpetic eruption of eyelids, 4, herpetic manifestations of the conjunctiva, 5, herpes of the cornea, 6, herpetic lesions of sclera and episclera, 7, of the uvea, 8, of the optic nerve, 9, of the ocular nervous apparatus, 10, ocular

lesions from herpetic virus and other associated germs, 11, diagnosis of ocular herpetic manifestations, 12, prognosis of ocular herpetic manifestations, and 13, therapy and prophylaxis of the ocular herpetic manifestations. Each chapter has a bibliography. (119 figures.) Melchiore Lombardo.

Cockayne, E. **Dwarfism with retinal atrophy and deafness.** Arch. Dis. Childhood, 1946, v. 21, March, pp. 52-54.

The author describes a sister and a brother first in 1936 and again in 1946. The condition, which is probably recessive, appears to be a definite entity not previously described. It is characterized by dwarfism with prognathism, thickening of the skull bones, and other skeletal changes, a peculiar form of retinal pigmentation, optic atrophy, and cataract, deafness, and mental deficiency. Theodore M. Shapira.

Duggan, W. F. **Vascular basis of allergy of the eye and its adnexa.** Arch. of Ophth., 1946, v. 36, Nov., pp. 551-611.

This excellent paper is essentially a monograph of the literature of the allergic manifestations in all the tissues of the eye.

To most physicians allergy means "hypersensitivity" to protein, whether of plant, animal or bacterial origin. The author includes all those aseptic or abacterial lesions in which the basic pathologic process can be reduced to the common denominator of either increased capillary permeability or excessive contraction (spasm) of smooth muscle or both. The only difference between the normal and the allergic person is one of degree. Every one probably has minor or transitory allergic manifestations during life. Allergic patients have more severe and more frequent attacks of allergy.

The relation of histamine to allergy is discussed in detail. Allergy of the ocular tissues can be interpreted as a manifestation of localized vascular dysfunction. This vascular dysfunction causes areas of localized tissue anoxia. Anoxemia is not usually, or necessarily, present.

Vasodilator therapy, which acts by relieving the tissue anoxia, seems to be of value in the treatment of the allergic lesions of the eye. This treatment is based on the pathologic physiology of the lesions. R. W. Danielson.

Duke-Elder, Sir Stewart. **Nutritional aspects of ophthalmology.** Irish J. Med. Sc., 1946, 6th series, June, pp. 177-189.

The author describes the ophthalmologically important vitamins A, B, C, and D and the affects of vitamin deficiencies on the various structures of the eye. Theodore M. Shapira.

Gabardi, E. F. and Zanello, D. **Oculomedullar syndrome caused by a metastasis of a pancreatic carcinoma.** Riv. Oto-Neuro-Oft., 1941, v. 18, no. 3, pp. 199-244.

A 9-year-old boy developed bilateral choked discs, proptosis, severe chemosis, blindness and immobility of both eyes, and later nodules beneath the skin of his face and neck. It was not until six months later that the primary lesion, a pancreatic carcinoma, produced clinically recognizable symptoms. A flaccid paraplegia occurred two days before death. Extensive carcinomatous infiltration of the spinal leptomeninges was found at necropsy. (33 illustrations, more than 150 references.) K. W. Ascher.

Gorduren, S. **Conjunctival findings in cases of cold haemagglutination.** Brit. Jour. Ophth., 1946, v. 30, Oct., pp. 613-616.

The conjunctiva of two patients suffering from cold haemagglutination were chilled by the application of cold isotonic salt solution. The temperature of the salt solution varied from 37 to 0 degrees centigrade. The vessels underwent marked constriction with agglutination of the red cells. The blood columns became segmented. At 27 degrees this occurred in 45 seconds and the vascular pattern returned to normal in 45 to 60 seconds. At the freezing point the phenomenon developed in 3 to 5 seconds and disappeared in 150-170 seconds. Morris Kaplan.

Lopez, P. M. **Ocular symptoms and complications of epidemic cerebrospinal meningitis.** Arch. de la Soc. Oft. Hisp.-Amer., 1945, v. 5, Oct., pp. 871-883.

The material for this study comprises 102 patients, of whom 57 had ocular complications. It is pointed out that ocular complications are recorded principally on patients who were examined by ophthalmologists. Pediatricians or internists are apt to overlook ocular symptoms. In as much as the conjunctival sac may be the initial site of infection with the meningococcus, Lopez urges that during epidemics cultures for the meningococcus should be made in all cases of conjunctivitis. People exposed to the disease should be watched.

The severity of the ocular symptoms appears to be proportional to the severity of the disease, and Lopez divides the cases into severe, moderately severe, and mild. The tabulated data show that among the severe cases, which constituted 25 percent of the total number, there were three of amaurosis with normal fundus and pupillary reactions, caused by the toxic action on the higher visual centers; three of spasmodic strabismus; two with conjugate deviation; four with rigidity; eight with Goppert's sign, which is a pupillary dilatation in response to slight stimulation of the skin; two with papillitis due to a descending neuritis; one of papillary edema caused by an inflammation of the choroidal plexus; one of keratitis, not of the neuroparalytic type; two cases of endophalmitis.

In the moderately severe cases, which represent 35 percent, the predominating complications were transient optic neuritis, transient strabismus due to involvement of the sixth nerve, muscular rigidity, Goppert's symptom, and irido-cyclitis. In the mild cases, constituting 42 percent, the ocular complications were insignificant.

The author's experience confirms the prevalent opinion that the most effective therapy is intensive administration of sulfa drugs and lumbar punctures. In cases of endophthalmitis and panophthalmitis hemotherapy with the blood of parents was used in addition to sulfatherapy and with benefit; the parents were first saturated with sulfa drugs and their blood, mixed with a foreign protein, was injected intramuscularly. Ray K. Daily.

Pirisi, B., and Mesina, R. **Lawrence-Moon-Bardet-Biedl Syndrome.** Riv. Oto-Neuro-Oft., 1941, v. 18, Sept.-Oct., pp. 361-420.

An extensive review of 152 cases published up to 1941 is presented, and two (brother and sister) observations of his own are reported. These two patients had retinitis pigmentosa sine pigmento, hemeralopia, nystagmus,

adiposity, genital dystrophy, mental debility, mongoloid faces, and dental anomalies, but no polydactyly, except for one foot which had six toes. (12 figures, bibliography.)

K. W. Ascher.

Rossi, V. **Reticulo-endotheliosis in ophthalmology.** Arch. di Ottal., 1946, v. 50, Jan. and Feb., pp. 1-19.

Rossi reviews the literature on the reticulo-endothelial system in general medicine and ophthalmology. One patient is described who had a generalized glandular enlargement and nodules in both upper fornices. There was a monocytosis of 25 to 27 percent. In the diagnosis the syndrome of Heerfordt and Mickulicz disease, both diseases of the reticulo-endothelial system were considered. The diseases of Nieman-Pick, Gaucher, and Christian-Schüller are in the same group.

Another patient was thought to have involvement of the choroid by mycoses fungoides. There were edema of the papillae, moderate hemorrhages and extreme dilatation of the veins, a papulous erythema of the lids, intense hyperemia of the conjunctiva, and enlargement of the preauricular gland. Later this patient returned. He was amaurotic, and in the yellow fundus, all landmarks were completely erased. The similarity to von Hippel-Lindau disease without cystic degeneration and detachment but with proliferation of the reticulo-endothial elements of the retina and the neuroglia is noted.

Francis P. Guida.

Wagener, H. P. **Temporal arteritis and loss of vision.** Am. J. Med. Sc., 1946, v. 212, Aug., pp. 225-228.

Inflammation of the temporal artery occurs in those of advanced age and is probably a local manifestation of a systemic arterial disease. In about one third of the patients there is loss of vision. In some the visual loss arises from central artery closure, in others venous phlebitis in the retina with hemorrhages and exudates.

Johnson, Harley, and Horton suggested the possibility of a direct extension of the lesion from the temporal arteries into the arteries of the optic nerve. They found that vasodilator drugs were harmful. The loss of vision may be out of proportion to the visible changes in the disc and retina Sudden complete blindness with a normal fundus may be due to ischemic or anoxemic retrobulbar neuritis. The ophthalmoscopic lesions fall into three groups: closures (thrombosis) of the central artery of the retina or of branch arterioles, ischemic optic neuritis, and indeterminate. The neuritic type is the most common.

More general recognition of this syndrome will help to explain sudden complete or partial loss of vision in elderly individuals. Retinal arterial closure with atypical visible lesions should make one suspect temporal arteritis. Loss of vision during the stage of active inflammation when the temporal arteries are cordlike and tender, pain on fatigue on chewing makes the diagnosis easy. If visual loss occurs late a history of inflammation of the temporal arteries helps in diagnosis.

Francis M. Crage.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Allen, T. D. **A small plant industrial eye program.** Trans. Amer. Acad. Ophth., 1946, May-June, pp. 205-210.

Opthalmic examinations and placement programs for employees based

on these examinations have not been suitable financially for smaller plants of 200 to 500 employees. The Illinois Society for the Prevention of Blindness made available the services of a safety engineer, illuminating engineer, and a visual survey technician at the cost of one dollar per employee examined. These examinations were made in several small manufacturing plants and the results were very satisfactory. The accident rate was materially reduced after the examinations were made and corrective measures were adopted. Chas. A. Bahn.

Anastossoff, A. **The scientific and social work of Constantin Pascheff.** Revue Bulgare d'Opht., 1943, v. 2, pp. 1-34.

This is a detailed review of Professor Pascheff's numerous papers and an evaluation of their importance for general pathology, as well as for every branch of ophthalmology. His contributions towards an improvement of the Public Health Service and the service for the visually handicapped and blind in Bulgaria are emphasized. (References.) Alice R. Deutsch.

Cisney, Harland N. **Vision testing in an automotive accessories industry.** Trans. Amer. Acad. Ophth., 1946, March-April, pp. 170-174.

Four thousand individuals were examined visually at 26 feet and 13 inches. Visual acuity with both eyes together and with each eye separately as well as phorias, vertical and lateral, depth perception, and color discrimination were measured at 26 feet and visual acuity and phorias at 13 inches. It was found that 75 percent of those who passed the approved visual standards were rated as good operators whereas only 33 percent of those who did not meet the standards were rated as good operators. Wall charts for testing distant vision are less efficient than modern mechanical methods if properly used. Chas. A. Bahn.

Cooper E. L. **A method for classifying employees for selective placement.** Trans. Amer. Acad. Ophth. and Otolaryng., 1946, Jan.-Feb., pp. 135-139.

Only near and distant visual acuity is needed for the routine examination of employees in industry. The combined visual efficiency of the two eyes is then computed in accordance with the formula of the A.M.A. committee on compensation for eye injuries. All examinees are divided into three groups: physically qualified (P.Q.), not physically qualified (N.P.Q.) and physically qualified with exceptions (P.Q.X.). Those who are rated N.P.Q. are not visually eligible for any position. Those rated P.Q. are eligible for positions ranging from the lowest to the highest visual requirements. Special examinations such as those for muscle balance, color perception, and depth perception are made for examinees qualifying for positions requiring these tests. The group P.Q.X. includes those who have handicaps which exclude them from some occupations but not all.

The system has the advantage that it can be readily adapted to the requirements of any employer without special medical personnel or special testing equipment. It eliminates unnecessary routine testing but provides supplementary tests in specific fields of effort. Charles A. Bahn.

Dickson, R. M. **A statistical analysis of persons certified blind in Scotland.** Brit. Jour. Ophth., 1946, v. 30, July, pp. 381-405.

In this complete, detailed study of the 7,297 registered blind of Scotland many interesting facts are found. Causes of blindness in order were: cataract, 17.1 percent; myopia, 14.9 percent; chronic septicemia, 10.8 percent; syphilis, 10.0 percent; glaucoma, 8.1 percent; injury, 5.9 percent. Since the first two appear latest in life, they accounted for fewer years of blindness while such causes as congenital anomalies, ophthalmia neonatorum, and congenital lues accounted for 44.5 percent of the total years of blindness. The highest incidence is among miners, metal workers, spinners, and weavers. In Scotland, a person is legally blind if he has less than 3/60 vision or the visual fields contracted to 10 degrees although the vision may be 6/60 or better. (22 tables.)

Morris Kaplan.

Ehlers, Holger. **The Causes of Blindness in Denmark.** Jour. of Social Ophth., 1946, v. 3, July, pp. 23-28.

Smallpox, trachoma, ophthalmia neonatorum, scrofula, and xerophthalmia (during World War I) have been eliminated as causes of blindness. The causes now are congenital anomalies such as malformations, microophthalmia, congenital cataract, retinitis pigmentosa, amotio retina, and optic atrophy. There has been a great increase in the number of patients with weak eyesight in the past ten years, whereas the number of patients attending a school for the blind show a marked decline. I. E. Gaynon.

Gradle, H. S. **Graduate training in ophthalmology—Jackson Memorial Lecture.** Trans. Amer. Acad. Ophth. and Otolaryng., 1945-46, Sept.-Oct. pp. 10-14.

The evolution of graduate training and the accomplisments of the American Board of Ophthalmology are reviewed. The need of standardized ophthalmic training between the completion of the intern year and certification by the Board is emphasized. The plan recommended would include training in basic science for three to six months at a university and medical school. In this course laboratory demonstrations and directed conferences and quizzes would be of first importance. The basic training would be followed by a period of clinical training of not less than two years. This would be given preferably in special university hospitals or general hospitals, if a sufficient staff could be secured. Conferences and seminars would take up major and important subjects. If possible, this training should lead to a degree and automatic certification by the American Board of Ophthalmology. Chas. A. Bahn.

Jablonski, Walter. **Ophthalmological impressions in the Orient.** Ophthalmologica, 1946, v. 112, July, pp. 39-46.

Jablonski visited Palestine, Egypt, and Cyprus. He noted a preponderance of external eye diseases and their resulting deformities. Koch-Weeks conjunctivitis breaks out with surprising regularity and vehemence about three months after the last rains and is often complicated by corneal ulcer. It is usually followed by an epidemic gonorrhoeal ophthalmia which in the Orient is transmitted from eye to eye and causes most of the blindness. Toward the end of the summer an epidemic conjunctivitis is observed that resembles swimming pool conjunctivitis. It occurs more frequently in the coastal plains than in the mountains.

Throughout the year one sees vernal conjunctivitis, diplobacillus conjunctivitis, and the ubiquitous trachoma. The latter usually is treated surgically. Fly larvae in the conjunctival sac are found occasionally. Corneal fistulas, descemetocele, (following corneal ulceration) and purulent dacryocystitis are common. Metasyphilitic eye symptoms are rare, perhaps because the population is infected with malaria. Tobacco-alcohol amblyopia is almost never seen. Early cataract formation seems to be common and certainly glaucoma, often starting in youthful age, is relatively frequent. All hereditary degenerations and malignant myopia are common, probably because of marriage among blood relatives. (References.)

F. Nelson.

Massoud, F. **Egypt's contribution during the war to protection against disease through care of eyes of babies.** Brit. Jour. Ophth., 1946, v. 30, Oct., pp. 617-622.

A program of prevention of trachoma and ophthalmia was carried out, so successfully that in many areas 70 to 90 percent of the eyes of children are normal and in some public schools all pupils have healthy eyes. (3 tables.)

Morris Kaplan.

Minton, Joseph. **Ophthalmic problems and visual standards in industry.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 298-303.

A plea is presented for more widespread and more intelligent use of routine ophthalmic examinations in industry. Morris Kaplan.

Neubert, F. R. **Ophthalmic experiences in the Royal Air Force.** Brit. Jour. Ophth., 1946, v. 30, Oct., pp. 601-606.

A statistical analysis of the results of the ophthalmic examination of candidates for air crew duties is reported. The tests done were visual acuity, manifest hyperopia, cover test, Maddox rod, Bishop Harman test, convergence, accommodation, visual fields (confrontation), color vision and fundus examination. Morris Kaplan.

Poleff, L. **Necessity of an international study center of trachoma.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 287-290.

The author presents a plea for the establishment in Morocco of an international center for the study of trachoma, the greatest medical scourge of the world today. Morris Kaplan.

Pollock, W. B. I. **Arabian ophthalmology.** Brit. Jour. Ophth., 1946, v. 30, Aug., pp. 445-457.

An interesting, detailed history of ophthalmology in Arabia and Persia from the 9th through the 13th century is presented. Of most interest was the operation for cataract in which the surgeon inserted a small hollow tube into the lens and sucked up as much of the contents as possible.

Morris Kaplan.

Redway, L. D. **Plant experience with metallic stencils.** Trans. Amer. Acad. Ophth., 1946, Jan.-Feb., pp. 139-141.

Metallic stencils used for addressing mail must be checked before and after use, which requires a high degree of binocular function, accurate depth perception, and manual cooperation. The stencils act as metal mirrors which cause uncomfortable flashing reflections. Overhead fluorescent lighting of 65 foot candles at working height and the wiping of the stencils with a quick

drying ink materially reduced these ocular symptoms. The author believes that the usual visual screening methods should not be interpreted too rigidly.

Chas. A. Bahn.

Reed, H. **Incidence of trachoma in the Southern Highlands Province of Tanganyika.** Brit. Jour. Ophth., 1946, v. 30, Oct., pp. 573-580.

This study attempts to explain the definite geographic variation of trachoma among the Africans. The incidence among all natives in this province was about 50 percent and yet it varied from 13 to 87 percent in the various districts. The disease was generally mild and uninfluenced by climate or other geographic factors. Occupation which determined the state of personal cleanliness seemed important. The incidence was greatest where raising of cattle brought flies. Morris Kaplan.

Reeh, M. J., Stimmel, E. W., and Heagan, F. V. **A motor-driven ophthalmotrope.** Amer. Jour. Ophth., 1947, v. 30, Jan., pp. 58-59. (3 figures.)

Rodin, Frank H. **Eserine: its history in the practice of ophthalmology.** Amer. Jour. Ophth., 1947, v. 30, Jan., pp. 19-28. (7 figures, references.)

Sbikowski, Enrique de. **Prevention of ocular accidents.** Arch. de la Soc. Oft. Hisp.-Amer., 1946, v. 6, Jan., pp. 82-84.

The author asks that failure to carry out protective measures should be recorded in the case records of traumatic accidents. The ease with which serious accidents can be avoided should be explained to the injured. The importance of prëexisting diseases, especially of dacryocystitis, in the aggravation of otherwise minor injuries should be pointed out and dacryocystitis should be included in the list of reportable diseases. He advocates preliminary visual examination as a means of vocational adjustment, the correction of defects and refractive errors, and the elimination of agents injurious to the human eye from the home, the school, and industry. Ray K. Daily.

Smith, F. L. **Visual skills analyzed brings results; a plant experience.** Trans. Amer. Acad. Ophth., 1946, March-April, pp. 174-175.

A direct correlation was found between visual skills in successful employees and their lack in employees who failed. Since the introduction of a visual examination and follow-up program, complaints of eye strain in positions demanding visual skills have markedly diminished.

Chas. A. Bahn.

Sorsley, A. **Nineteenth century provincial eye hospitals.** Brit. Jour. Ophth., 1946, v. 30, Sept., pp. 501-546.

This comprehensive historical account of all the eye hospitals in the British Isles in the nineteenth century reveals the fact that 52 such hospitals were founded and used and only 18 of them remain today.

Morris Kaplan.

Souza, J. L. de. **Luzia, protector of the eyes.** Arquivos Brasileiros de Oft., 1946, v. 9, April, pp. 49-64.

According to the ecclesiastical record, Santa Luzia (or Lucia) was a Christian virgin who underwent martyrdom in Siracusa in the year 304, in the Diocletian persecution. She appears to be referred to in an epitaph found in Saint John's catacombs (Siracusa), and her name is attached to a Mass in the Gregorian Sacrament

(A.D. 590-604). Her remains were removed from the Siracusa catacombs to a cathedral dedicated to her at Corfino in the dukedom of Spoleto, and later were taken to Metz. Although usually depicted as carrying in her hands a tray on which are seen two eyes, there is nothing in the history of her life and death to suggest anything connected with eyes. It is possible that confusion has arisen from the fact that her saint day is the same as that of Saint Odilia, who is said to have been born blind and to have recovered her sight upon baptism by the Bishop of Ratisbon. (References.)

W. H. Crisp.

Stump, F. N. **How ophthalmic eye care can prevent many industrial accidents.** Trans. Amer. Acad. Ophth., 1946, July-Aug., pp. 219-225.

The author believes that 98 percent of industrial accidents are preventable. Based on an Ortho-Rater examination in numerous plants a statistical resume is given and a pattern of requirements is made for different vocations. Three separate groups are compared. Sixty more employees in the accident-free group had standard visual acuity than in the seriously injured group. In the accident-free group 68 percent more had standard depth perception than in the seriously injured group. New employees farthest below visual standards had 75 percent more accidents than those who were acceptable.

Chas. A. Bahn.

Swanson, C., and Stewart, R. A. **Causes of blindness in U. S. Naval and Marine Corps.** U. S. Naval Med. Bull., 1946, v. 46, April, p. 520.

The causes in 119 cases of bilateral blindness, and 640 cases of unilateral blindness, reported in the U. S. Navy and the Marine Corps during World War II, until January 1, 1945 are classified. Of bilateral blindness, 60 percent, and of unilateral, 50 percent, was traumatic and due to enemy action. Sixteen percent of the bilateral blindness resulted from methyl alcohol poisoning.

Benjamin Milder.

Taylor, W. O. G. **Occupational therapy in eye wards.** Brit. Jour. Ophth., 1946, v. 30, Aug., pp. 456-461.

The author indicates the usefulness of occupational therapy in eye wards and lists nine crafts that are suitable for eye patients who need occupational therapy. Special warning is given to omit basketry because of its general association with blindness. (6 illustrations.)

Morris Kaplan.

Tiffin, J., and Wirt, S. W. **Determining visual standards for industrial jobs by statistical methods.** Trans. Amer. Acad. Ophth., 1945, Nov.-Dec., pp. 72-93.

Visual requirements for employment may be based on arbitrary opinions of standards required and on statistical facts which determine the necessary minimum requirements for a specific position. By the statistical method the selection of better workmen is facilitated, employees with different visual skills can be allocated to appropriate jobs; and those with inferior visual skills can be employed productively rather than be denied employment based on rigid arbitrary standards. With periodic testing, losses in visual skills are disclosed and their correction may be accomplished before production or safety is affected. The increased demand for the services of an ophthalmologist is also mentioned.

Two methods of segregating workmen and making statistical compari-

son of their visual skills are used: (1) "Follow-up" method in which all new employees on a specific job are tested and the results tabulated for future analysis; (2) the testing of present employees on a job, classifying them on the basis of quantity and quality of production. The results of such investigations make possible appraisal of the visual requirements of any specific position. Chas. A. Bahn.

Tolman, C. P. **Eye conservation and increased production.** Trans. Amer. Acad. Ophth., 1946, July-Aug., pp. 225-230.

Conservation and utilization of eyesigst in industry is a profitable investment. Two out of five workers have visual deficiencies which prevent their best possible work and in 90 percent of them the vision can be made satisfactory by glasses. Adequate lighting will increase production. A proper color scheme will lessen fatigue, increase production, and increase the efficiency of lighting. Minimal visual requirements should be determined for any specific position and all employees should have a visual test.

Chas. A. Bahn.

Wheeler, J. R. **History of ophthalmology through the ages.** Brit. Jour. Ophth., 1946, v. 30, May, pp. 264-275.

This rather inclusive paper covers 4,200 years of ophthalmology.

Morris Kaplan.

Yousefova, F. I. **A. G. Vasutinski, a great scientist.** Oftal. Jour. (Odessa), 1946, pt. 2, pp. 3-7.

A. G. Vasutinski, who was director of graduate study in ophthalmology at the University of Kiev, is eulogized.

Ray K. Daily.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Franceschetti, A., and Valerion, M. **Associated malformations of the eyes and ears.** Confinia Neur. Basek, 1944-45, v. 6, no. 5, pp. 255-257.

The association of malformation of the eyes and ears is rare. The author presents a case of bilateral microphthalmus and corneal opacity in a patient whose ears had external deformities. A brother had a similar condition. The malformation of the eyes probably developed in the seventh or eighth week of embryonic life, while the ear condition dveloped about four months before birth.

O. H. Ellis.

NEWS ITEMS

Edited by DONALD J. LYLE, M.D.
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News items should reach the editor by the 12th of the month

DEATHS

Dr. Reuben Bennett Anderson, Jr., Fort Worth, Texas, died January 2, 1947, aged 52 years.

Dr. Enga Mitchell Arnold, Houston, Texas, died November 1, 1946, aged 64 years.

Dr. Morris Louis Harris, Brooklyn, New York, died November 28, 1946, aged 59 years.

Dr. William Edward Patterson, Minneapolis Minnesota, died October 30, 1946, aged 71 years.

Dr. Charles Tiffany St. Clair, Bluefield, West Virginia, died November 17, 1946, aged 73 years.

Dr. George N. Seidlitz, St. Louis, Missouri, died November 5, 1946, aged 85 years.

Dr. Samuel Anise Shoemaker, Orlando, Florida, died November 6, 1946, aged 80 years.

Dr. Andres Jay Timberman, Columbus, Ohio, died October 15, 1946, aged 82 years.

MISCELLANEOUS

VETERANS' ADMINISTRATION PROSTHESES

The Army's plastic artificial eye has been used by more than 7,500 former soldiers during the past three years and has been adopted by Veterans' Administration in furnishing ocular prostheses to patients, the War Department announced recently.

Developed first in 1943 by a former major in the Army Dental Corps while stationed in England, this type of acrylic eye has practically replaced glass eyes which were used almost exclusively before World War II. The Army Medical Department developed this eye after the war broke out, when both civilian and military supplies of artificial eyes were depleted due to high breakage and inability to replenish supplies. Glass eyes then used in the United States were largely German-made.

As early as 1943, the Army made plans to discard the easily breakable, inferior, custom-made glass eye when Major (then Lieutenant) Stanley F. Erpf of San Francisco, California, assigned to the job by Col. Derrick T. Vail, Consultant in Ophthalmology in ETO, successfully demonstrated the artificial eye made of water-clear plastic and individually fitted and colored. In January, 1944, the first training center for ophthalmoprosthetists was organized at the 30th General Hospital, England. Forty American dental officers and 10 British dental officers attended.

Dr. Robert E. Stewart, Chief, Ophthalmoprosthetic and Restoration Division, Prosthetic Appliance Service, Veterans' Administration, said today that all 15 technicians making artificial plastic eyes for Veterans' Administration are Army-trained. They were dental officers and technicians especially trained in this work during the war.

"The Army-developed artificial eye has proved superior to any other type of ocular prosthesis available today," Dr. Stewart declared. "Of about 500 World-War II veterans who have applied to the Veterans' Administration for ocular prosthesis aid, none had any serious complaint about the acrylic eye. They wanted lost eyes replaced, socket corrections, or needed refitting because of other operations."

Dr. Stewart said the Army-developed eyes were never broken when dropped nor had the coloring in the eyes deteriorated. He explained that some eyes had become roughened due to hard usage, but this was easily remedied.

SCHOLARSHIP FUND ESTABLISHED

The Delta Gamma fraternity, an international organization of college women, announces the establishment of a fund for scholarships in the fields of Prevention of Blindness and Sight Conservation exemplified by specialized prevention study, training of orthoptic technicians, training of teachers for sight-saving classes, and training of workers for the preschool blind.

Information on basic qualifications for the various fields will be sent upon request. Application blanks may be obtained from Mrs. Richard P. Miller, 39 West Jefferson Road, Pittsford, New York.

Advising the fraternity's council and project committee in the selection of candidates and administration of the fund is a professional committee consisting of: Dr. LeGrand Hardy, Chairman, president of the American Orthoptic Council; Mrs. Virginia S. Boyce, administrative assistant, National Society for the Prevention of Blindness; Miss Ruth E. Lewis, professor of social work, George Warren Brown School of Social Work, Washington University; Miss Ruth B. McCoy, assistant director, New York State Commission for the Blind; Dr. Lillian Ray Titcomb, president, Executive Committee, Nursery School for Visually Handicapped, Los Angeles.

SOCIETIES

READING SPEAKER

The Reading Eye, Ear, Nose, and Throat Society, Reading, Pennsylvania, had as speaker

for the January meeting, Dr. Benjamin F. Sounders, whose topic was "Some Recent Developments Regarding Enucleation. Modern Implants and Prostheses, with Particular Reference to the Cutler and Reudemann Techniques."

Milwaukee meeting

The annual meeting of the Milwaukee Oto-Ophthalmic Society was held on January 28th. Dr. Erwin E. Grossman of Milwaukee was the ophthalmic speaker. His paper, "Gonioscopy and Glaucoma," was the thesis he presented for membership in the society. Dr. J. B. McBean of the Mayo Clinic spoke on "Observations in the Management of Vasomotor Rhinitis."

Texas society officers

At the December meeting of the Texas Society of Ophthalmology and Otolaryngology held in Dallas, Dr. W. E. Vandevere, El Paso, was elected president; and Dr. E. D. Dumas, San Antonio, was elected secretary. The next annual meeting of the society will be held at Houston in December, 1947.

Washington guest speaker

The Washington, D.C., Ophthalmological Society had as guest speaker for the January meeting, Dr. Charles E. Iliff of the Wilmer Institute, Johns Hopkins University. He spoke on "Beta Irradiation in Ophthalmology."

A case presentation was given by Dr. M. Noel Stow on "Pseudoxanthoma Elasticum with Angioid Streaks: The Syndrome of Groenblad and Standberg." Two case presentations were given by Dr. Ralph N. Greene, Jr.; one on "Possible Tumor of the Macula," the other on "Multiple Cholesterol Deposits of the Retina." Dr. Edward J. Cummings spoke on "Epithelioma of the Lid," and Dr. A. J. Delaney spoke on "Pigment Proliferation or Benign Melanoma."

Announcement

Oregon postgraduate course

The Oregon Academy of Ophthalmology and Otolaryngology announces its eighth annual spring postgraduate course to be held in Portland, April 7 to 12, 1947. A fine program has been arranged by the Oregon Academy and the University of Oregon Medical School.

Dr. John Dunnington, professor of ophthalmology at Columbia University, New York, and Dr. George Shambaugh, professor of otolaryngology at Northwestern University Medical School, Chicago, will be the guest speakers.

There will be lectures, clinical demonstrations, and ward rounds. In order to make the course more personal and practical, registration will be limited to 125. Further information may be obtained from Dr. Harold M. U'ren, secretary, 1735 North Wheeler Avenue, Portland 12, Oregon.

Personals

During February, Dr. Arthur Linksz continued the series of lectures and demonstrations on "Physiological and Geometrical Optics," at the Manhattan Eye, Ear, and Throat Hospital, New York.

Ben A. Ramaker and Ivan L. Nixon have been appointed managers of the Bausch & Lomb Optical Company's ophthalmic and instrument divisions. Raymond H. Andersen was named to succeed Ramaker as head of the company's ophthalmic sales, and Lysle B. McKinley was appointed successor to Nixon as manager of the firm's instrument sales division.

Dr. Trygve Gundersen has been appointed assistant professor of ophthalmology at the Harvard Medical School.

Dr. H. Saul Sugar is now located at 2311 David Broderick Tower, Detroit 26, Michigan.